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Teacher Readiness in Integrating Technology in English Language Lessons

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Teacher Readiness in Integrating Technology in English Language Lessons

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DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

The Malaysian National Education Blueprint (2013) set forth a ten-year plan for English language education reform, emphasising a systematic approach to curriculum and the significant role of technology in improving teaching and learning. At the core of it, teachers as the agent of transformation are required to be equipped to effectively integrate technology in classroom instruction. This calls for teachers to develop the teacher knowledge necessary for the task – the Technological Pedagogical Content Knowledge (TPACK). This study investigated teacher readiness in integrating technology in English language lessons, by looking at their level of TPACK, and also the factors determining their TPACK. This study involved 201 in-service secondary school English language teachers in Sarawak, Malaysia. This mixed-method study utilised an adapted questionnaire by Baser et al. (2016) and an adapted interview protocol by Slutsky (2016). The findings showed that teachers have high Technological Knowledge, Pedagogical Knowledge, Technological Pedagogical Knowledge, Technological Content Knowledge, and Technological Pedagogical Content Knowledge, and very high Content Knowledge and Pedagogical Content Knowledge. Students, learning autonomy, professional support, institutional support, proven success, and curriculum were found to be factors determining teachers' TPACK.

Keywords: TPACK, readiness, technology integration, factors, English language teachers

Kesediaan Guru dalam Mengintegrasikan Teknologi dalam Pelajaran Bahasa Inggeris

ABSTRAK

Pelan Pendidikan Kebangsaan Malaysia (2013) telah menetapkan rancangan sepuluh tahun untuk reformasi pendidikan bahasa Inggeris, dengan menekankan pendekatan sistematik kepada kurikulum dan peranan penting teknologi dalam meningkatkan pengajaran dan pembelajaran. Di pusatnya, guru sebagai ejen transformasi perlu dilengkapi untuk mengintegrasikan teknologi dengan berkesan dalam pengajaran di kelas. Ini memerlukan guru untuk membangunkan pengetahuan guru yang diperlukan untuk tugasan - Pengetahuan Kandungan Pedagogi Teknologi (TPACK). Kajian ini menyiasat kesediaan guru dalam mengintegrasikan teknologi dalam pelajaran bahasa Inggeris dengan memandang kepada tahap TPACK mereka, dan juga faktor-faktor yang menentukan TPACK mereka. Kajian ini melibatkan 201 guru bahasa Inggeris sekolah menengah yang sedang berkhidmat di Sarawak, Malaysia. Kajian kaedah campuran ini menggunakan soal selidik yang diubahsuai daripada Baser et al. (2016) dan protokol temu bual yang diubahsuai daripada Slutsky (2016). Penemuan menunjukkan bahawa guru memiliki Pengetahuan Teknologi, Pengetahuan Pedagogi, Pengetahuan Pedagogi Teknologi, Pengetahuan Kandungan Teknologi, dan Pengetahuan Kandungan Pedagogi Teknologi yang tinggi, dan Pengetahuan Kandungan dan Pengetahuan Kandungan Pedagogi yang sangat tinggi. Pelajar, autonomi pembelajaran, sokongan profesional, sokongan institusi, kejayaan yang terbukti, dan kurikulum didapati sebagai faktor-faktor yang menentukan TPACK guru.

Kata kunci: *TPACK, kesediaan, integrasi teknologi, faktor, guru Bahasa Inggeris*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CEFR	Common European Framework
CK	Content Knowledge
CPD	Continuous Professional Development
DELIMA	Digital Educational Learning Initiative Malaysia
EFL	English as Foreign Language
ELTC	English Language Teaching Centre
ESL	English as Second Language
ICT	Information and Communication Technology
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
TCK	Technological Content Knowledge
TK	Technological Knowledge
TPACK	Technological Pedagogical Content Knowledge
TPCK	Technological Pedagogical Content Knowledge
TPK	Technological Pedagogical Knowledge

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter, the background of the study is presented in Section 1.2, followed by the formulation of the statement of the problem in Section 1.3. The aim and objectives of the study are then specified in Section 1.4, while the operational definitions of terms are presented in Section 1.5, followed by an explanation of the significance of the study in Section 1.6, and the scope of the study in Section 1.7.

1.2 Study Background

The Malaysian National Education Blueprint, established in 2013, set forth a comprehensive 10-year roadmap from 2021 to 2025 for the reform of English language education in the country. This blueprint presented a holistic, integrated, and systematic approach to the new curriculum, outlining its objectives and implementation plan (Ministry of Education Malaysia, 2013). In the pursuit of educational transformation, leveraging information and communication technology (ICT) was identified as a crucial factor in enhancing the quality of learning across the nation through technology integration into classroom instruction and the management of educational institutions.

In response to this, the Malaysian government has undertaken significant efforts to enhance technology integration in English language classrooms. The Smart School project, launched in 1997, was one of the earliest initiatives aimed at equipping schools with ICT infrastructure, training teachers, and developing digital content (Hussin et al., 2009). In 2011, the government introduced the Frog VLE, an online platform offering educational resources, tools, and a communication channel for teachers, students, and parents to facilitate improved teaching and learning experiences (Bakar et al., 2020). Additionally, various professional development programs have been implemented under the Continuous Professional Development (CPD) program to further refine teachers' skills in technology integration within the classroom (Jamil et al., 2011). The English Language Teaching Centre (ELTC), operating under the Ministry of Education, also provides workshops and training programs specifically designed to help English language teachers enhance their abilities in incorporating technology into their classrooms (Ministry of Education Malaysia, 2013).

Also at the forefront of the change are today's learners, who have grown up surrounded by technology, and interact with and access technology in a markedly different manner compared to previous generations of learners and their educators (Prensky, 2001). Students' preferred learning methods have evolved with the affordance of the internet; they now favour watching tasks being performed on virtual applications and then attempting to duplicate and repeat them, rather than receiving instructions or reading about the topic (Hartman et al., 2019; Seemiller & Grace, 2017; Swanzen, 2018). Ellis (2003) and Nunan (2004) emphasised the importance of meaningful language tasks in relation to real-world context. This can be addressed by the integration of technology which provides a platform for learners to engage with tasks and problems they are familiar with (Raman et al., 2019).

However, successful technology integration can be influenced by various factors and conditions such as the teacher, learner, technology, innovations, infrastructure, and policy (Groff & Mouza, 2008; Pelila et al., 2022). Teachers, as the agents of this change, need to be more than just facilitators but also innovators, adeptly navigating the ever-changing technological domain and synchronising it with pedagogy (Rhema & Miliszewska, 2010; Teo, 2016; Tondeur et al., 2012). The rising expectations for these teachers have expanded their traditional knowledge boundaries, necessitating higher proficiency in technology (Council of Europe, 2012). Teachers need to have a holistic understanding of technology integration as encapsulated in the Technological Pedagogical and Content Knowledge (TPACK) framework (Koehler & Mishra, 2006). It suggests that for the Malaysian National Education Blueprint, teachers should not only master their subject matter but also adeptly pair it with the right instructional strategies and technological tools (Schmidt et al., 2019).

In conclusion, the Malaysian National Education Blueprint's emphasis on technology integration in English language education reflects the growing importance of technology in the globalised world.

1.3 Statement of The Problem

The use of technology in education, particularly in teachers' practices, has been extensively researched. Teachers have been shown to often use technology more for administrative tasks than for enhancing teaching and learning, which limits the full potential of technology integration. Studies such as those by Harris and Hofer (2009), Ottenbreit-Leftwich et al. (2010), Tondeur et al. (2012), and Watson et al. (2012) found that teachers tend to focus on technology tools without effectively integrating them into pedagogical methods. This approach often weakens the connection between content and teaching strategies, as Harris et al. (2014) argue, and overlooks student-centred goals. In Malaysia, Umar and Hassan (2015) reported similar findings, noting that many teachers either minimally integrated technology into their lessons or avoided it altogether.

The limited integration of technology in teaching highlights a broader issue: the lack of Technological Pedagogical Content Knowledge (TPACK) among teachers, which is essential for effective technology use in the classroom. However, the COVID-19 pandemic significantly shifted this dynamic. Research conducted during the pandemic

(König et al., 2020; Moorhouse, 2020; Schleicher, 2020) revealed that technology became crucial for delivering lessons as face-to-face teaching was no longer feasible. Teachers had to adapt quickly, learning to utilise online platforms, create meaningful digital activities, involve parents in the learning process, and manage online student interactions (Atmojo & Nugroho, 2020; Cavanaugh & DeWeese, 2020; Iswati, 2021; Peimani & Kamalipour, 2021; Pryor et al., 2020; Xia, 2020).

For instance, in Indonesia, Atmojo and Nugroho (2020) observed that teachers were compelled to rapidly develop the skills needed to deliver online lessons. In the United States, Cavanaugh and DeWeese (2020) highlighted the role of digital tools in maintaining student engagement during remote learning. Similarly, Iswati (2021) noted the urgent need in Southeast Asia for platforms that could support both live and recorded lessons during the pandemic. These examples demonstrate how the role of technology in education has evolved from a primarily administrative tool to a central component of the teaching process.

In Malaysia, this shift was also evident, but the quality of technology integration varied significantly. Some teachers were able to adapt well to the new demands, while others struggled due to a lack of training or familiarity with digital tools and platforms (Ishak et al., 2022; Wong, 2023). This inconsistency points to a gap in the readiness of teachers to integrate technology effectively, particularly when considering their levels of TPACK.

Studies on TPACK levels have shown that teachers' proficiency in integrating technology varies, but there remains a significant gap in understanding how TPACK develops across different proficiency levels. Research by Turgut (2017) in Turkey, for example, showed that pre-service teachers with more training experience had significantly higher Pedagogical Content Knowledge (PCK) and Pedagogical Knowledge (PK), while less experienced teachers demonstrated higher Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), and Technological Content Knowledge (TCK). Similarly, Nazari et al. (2019) found that in-service teachers in Iran with more experience excelled in PK and PCK, while beginner teachers had stronger TK, TCK, and TPK. However, despite these differences in knowledge domains, overall TPACK levels did not show significant variation, indicating that different factors influence the development of TPACK across teachers' careers.

Further research, such as that by Drajati et al. (2018) in Indonesia, found that while pre-service teachers had high TPACK levels, novice teachers used a wider variety of tools. However, experience and age were not significant predictors of TPACK proficiency. Similarly, Işler and Yıldırım (2018) found that while Turkish pre-service teachers reported high TPACK levels, their intentions to use technology depended on factors such as interest, mentor guidance, and access to technology. Paneru (2018), in a study of Czech in-service teachers, found that those who developed TPACK through collaborative methods showed increased creativity, whereas those who relied on conventional formal methods struggled to apply their knowledge effectively.

In Malaysia, Singh and Kasim (2019) reported that pre-service teachers demonstrated a strong understanding of TPACK, while Azhar and Hashim (2022) noted that in-service teachers exhibited high levels of TPACK, with particularly strong content knowledge. However, there is still a gap in understanding how teachers at different stages of their careers develop and apply TPACK in practice.

Thus, there is a clear need for further research to understand the factors that help teachers develop their TPACK skills at different levels of proficiency. This understanding is crucial because it enables the design of professional development programmes that are tailored to the specific needs of teachers, rather than relying on generic, one-size-fits-all approaches. As Polit and Beck (2017) argue, interventions should be evidence-based and adapted to individual needs to be most effective.

1.4 Aim and Objectives of The Study

This research aims to investigate the readiness in terms of teacher knowledge in integrating technology among English language teachers in the northern region schools in Sarawak and to identify the factors that determine their readiness in terms of teacher knowledge for technology integration in English language lessons. These are two objectives of the research:

1. to find out the English Language teachers' readiness in integrating technology in terms of Technological Pedagogical Content Knowledge.
2. to examine factors which determine the English Language teachers' Technological Pedagogical Content Knowledge for technology integration.

The study is guided by the following questions:

1. What is the English Language teachers' readiness in integrating technology in terms of Technological Pedagogical Content Knowledge?
2. What are the factors which determine the English Language teachers' Technological Pedagogical Content Knowledge for technology integration?

1.5 Operational Definition of Terms

In this study, several key terms and concepts will be used throughout. For ease of reference, their definitions are listed here in alphabetical order.

The CEFR-aligned curriculum in this study refers to a language teaching and learning framework that is designed according to the principles and guidelines of the

Common European Framework of Reference for Languages (CEFR). The CEFR, developed by the Council of Europe, is an international standard for describing language proficiency across various languages, encompassing six proficiency levels: A1, A2, B1, B2, C1, and C2 (Council of Europe, 2001). The CEFR provides a comprehensive set of descriptors and scales for measuring language skills in reading, writing, speaking, and listening, as well as offering guidelines for curriculum design, teaching, and assessment (North, 2023). The specific CEFR-aligned curriculum documents referred to by the study participants are of the English language Form one to Form five secondary school curriculum documents. The three compulsory documents that English language teachers work with for the CEFR-aligned curriculum are the Syllabus, the Curriculum Framework, and the Scheme of Work (Ministry of Education Malaysia, 2020). Students work with a CEFR-aligned English language textbook and workbook.

English as a Second Language (ESL) teachers in the context of this study refer to Malaysian secondary school teachers who specialise in teaching English language skills to Malaysian students in public school secondary educational settings. Specifically, the participants who are ESL teachers in the present study are 201 teachers in the Baram, Lawas, Limbang, and Miri districts in Sarawak, Malaysia teaching the English language in public secondary schools from Form one to Form five. These teachers are responsible for imparting linguistic proficiency in reading, writing, speaking, and listening in the English language, following the Malaysian national curriculum guidelines (Malaysia Ministry of Education, 2013). The specific ESL content being taught in the context of this study are those of Form one to Form five secondary schools following the CEFR-aligned curriculum in Malaysia, based on the three compulsory documents of the Syllabus, the Curriculum Framework, and the Scheme of Work (Ministry of Education Malaysia, 2020).

Teacher readiness for technology integration in the context of this study refers to the level of teacher knowledge, specifically the Technological Pedagogical Content Knowledge, in the context of English language teaching (Ertmer & Ottenbreit-Leftwich, 2010; Koehler & Mishra, 2009; Voogt et al., 2013). The TPACK provides a comprehensive framework to measure a teacher's readiness for technology integration because it encapsulates the crucial knowledge domains for successful technology integration, and how they interact within the teaching environment (Anuar et al., 2014; Kurniasih et al., 2022). In working towards better teacher professional development and learning, TPACK-based training programs help teachers learn and develop skills that are most relevant to their context and teaching needs (Schmidt et al., 2009). Teacher readiness in terms of TPACK for this present study was measured and categorised into five levels of mean range interpreted as Very Low (M=1.00-1.79), Low (M=1.80-2.59), Moderate (M= 2.60-3.39), High (M= 3.40-4.19), and Very High (M= 4.20-5.00) (Kan, 2009). This was done for all seven knowledge domains of TK, PK, CK, TPK, TCK, PCK, and TPK.

Technology for education ranges from simple tools such as digital devices, presentation software, and resource sites, to more complex tools like virtual learning environments, adaptive learning platforms, and augmented or virtual reality applications (Clark & Mayer, 2016). In the context of this present study, these technologies are the educational tools that can facilitate personalised learning, promote collaboration, and enable assessment and feedback, fostering the development of critical thinking, problem-solving, and communication skills among learners. The technologies mentioned in the study are also specified to those accessible to secondary school English language teachers in Malaysia. Examples of technology tools that can facilitate personalised learning are devices such as mobile phones, tablets, or computers with access to the internet. Examples of technology tools that can promote collaboration are websites and applications both online and offline such as Google Workspace, Padlet, Flipgrid, Quizizz and Microsoft Teams. Examples of technology that can facilitate assessment and feedback are applications and websites such as Kahoot, Google Forms, Socrative, Edmodo, and Turnitin. All the applications and websites mentionedabo are also examples of technology tools that can foster the development of critical thinking, problem-solving, and communication skills among English language learners in the context of this study. In the Malaysian context, all these technologies are available for teachers on Digital Educational Learning Initiative Malaysia (DELIMa), a digital learning management platform developed by the Malaysian Ministry of Education (Hui & Mahmud, 2022). All teachers in the present study have been assigned a free account by the Malaysian Ministry of Education and have access to all the resources on the platform. The technologies in the context of the present study are not limited to only those provided on the DELIMa platform, but also social media platforms such as Reddit, Twitter, YouTube, Pinterest, Instagram, and TikTok that act as educational tools as they facilitate personalised learning, promote collaboration, and enable feedback.

Technology integration in the context of this study refers to the incorporation of technology tools or resources into the teaching and learning processes to enhance educational outcomes (Roblyer & Doering, 2013). It involves the blending of technology with pedagogical practices, enabling students to develop critical thinking, problem-solving, and collaboration skills (Ottenbreit-Leftwich, et al., 2010).

The Technological Pedagogical Content Knowledge (TPACK) is a framework developed by Mishra and Koehler (2006) that provides a comprehensive understanding of the knowledge domains required for technology integration in education. TPACK emphasises the complex interplay of three primary knowledge domains: content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), and the domains that exist in the overlapping of these three: pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). In the context of the present study, it is used as a framework for teacher knowledge, and the level for each knowledge domain is measured by a questionnaire and interpreted in the form of a mean score.

1.6 Significance of the Study

The theoretical significance of this study is that the findings would be able to contribute to the understanding of teachers' readiness, in terms of their Technological Pedagogical Content Knowledge (TPACK), especially in English language teaching practice. The study would also contribute to the knowledge of whether different determinants are affecting the learning for teachers of different levels of TPACK.

There are several practical significances that this study can offer. With information from this research, teachers and policymakers can determine future funding and directions for professional development and up-skilling courses for teachers who may require such support to integrate technology into the English language instruction. This study hopes to provide up-to-date knowledge that can assist teachers in identifying their current level of readiness of teacher knowledge to integrate technology, and thus avoid the unsystematic provision of generic professional development courses which may be mismatched beyond or beneath what they know. Additionally, understanding the factors that determine teachers' acquisition of knowledge for technology integration can provide information on how professional development that should be provided or supported. It is hoped that by bridging this gap of knowledge, the study can contribute to the improvement of the standard of English language education in Malaysia. Another practical significance is that it can contribute to phase three of the Malaysian roadmap for systematic reforms of English language education whereby evaluation, review, and revision to the English language education reform based on studies and evaluation reports of feedback from teachers, learners, and schools (Ministry of Education, 2015). As teacher competency would also be evaluated, the present study can contribute to this by providing insights and information from the teachers implementing the curriculum under the roadmap. The findings of this study wish to be of practical help to stakeholders such as teachers, teacher trainers, material developers, and policymakers of the English language curriculum in Malaysia.

1.7 Scope of Study

The present study was carried out to investigate teacher readiness in integrating technology into English language lessons. This study involved 201 in-service English language teachers who teach in twenty eight secondary schools located in Sarawak, Malaysia. This study took place over two years from 2021 to 2022.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will present the literature review of English language teachers' readiness in terms of their Technological Pedagogical Content Knowledge for technology integration. The chapter is divided into two main sections. Section 2.2 looks at the theoretical framework of the study. Under this, subsection 2.2.1 will elaborate on the TPACK Framework, while subsection looks into the 2.2.2 Adult Learning Theory. The second main section of 2.3 reviews the literature on teacher knowledge. Under this, subsection 2.3.1 elaborates on assessing teachers' TPACK, 2.3.2 on TPACK and technology integration, 2.3.3 on TPACK of English language teachers, and finally, 2.3.4 reviews studies done on factors influencing the development of teacher knowledge for technology integration.

2.2 Theoretical Framework

This study is grounded in two theoretical frameworks, the Technological Pedagogical Content Knowledge (TPACK) framework and the Adult Learning Theory framework. The present study chooses to focus on TPACK which was extended from Shulman's PCK as it provides several advantages in the context of this study. Most primarily, the TPACK framework is helpful in designing professional development programs as it can inform the design of targeted programs with specific content areas in the subject matter and has a systematic framework for the assessment of teacher knowledge (Mishra & Koehler, 2006).

2.2.1 The Technological Pedagogical Content Knowledge (TPACK) Framework

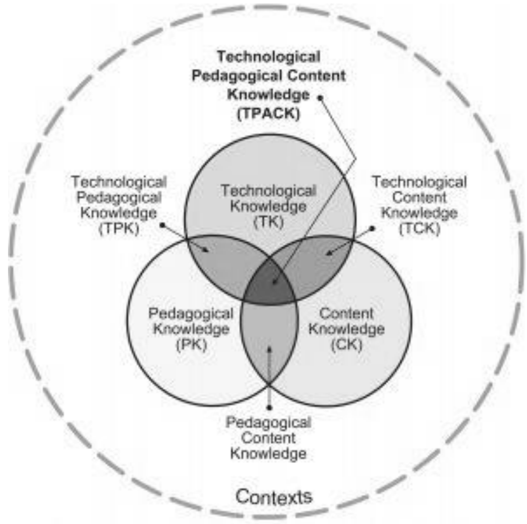

Figure 2.1: The TPACK Framework

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The Technological Pedagogical Content Knowledge (TPACK) framework proposed by Mishra and Koehler (2006) suggests that a teacher's Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), as well as the intersections of these knowledge domains - Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and Technological Pedagogical Content Knowledge (TPCK), is fundamental for technology integration within the teachers' instructional contexts. The framework a systematic approach to assessing teachers' readiness for technology integration in the teaching and learning contexts bases (Mahdum, 2015; Mishra, 2019; Schmidt et al., 2009; Tondeur et al., 2017), and this systematic approach provides teachers and stakeholders with information of specific knowledge domains that teachers have and those that they need to improve on, for their knowledge to be relevant in the specific context of their teaching environment (Misieng et al., 2018; Mtebe & Mishra, 2019; Raphael, 2018).

alphabetical order In essence, measuring the level of teacher knowledge for technology integration through the TPACK framework provides a systematic look into where teachers are at, what they lack, and what specific professional development and training is needed (Lim et al., 2021, Yang et al., 2019).

Table 2.1: Definition, Scope, and Example of TPACK Knowledge Domains

Teacher Knowledge	**Definition**	**Scope**	**Example**
Technological Knowledge (TK)	Knowledge and skills related to the use of technology.	Knowledge of specific technologies, such as software and hardware, as well as general knowledge about how technology can be used to support teaching and learning.	Using grammar-checking tools such as Grammarly.
Pedagogical Knowledge (PK)	Knowledge and skills related to teaching and learning.	Knowledge of instructional strategies, assessment techniques, and classroom management.	Incorporating "think-pair-share" activities to encourage students' reflection and collaborative learning.
Content Knowledge (CK)	Knowledge about the subject matter being taught.	Factual knowledge (basic information and facts) and conceptual knowledge (understanding of underlying principles and theories).	Understanding the structure, elements, and techniques of story-writing.
Technological Pedagogical Knowledge (TPK)	Knowledge related to the integration of technology into pedagogical practices.	Requires understanding of both PK and TK, enabling teachers to use technology that supports teaching and learning goals.	Using audiobooks with listening comprehension activities, allowing multiple plays and pauses, and catering to learners' varied learning paces and preferences.
Technological Content Knowledge (TCK)	Knowledge related to the use of technology to teach specific content.	An extension of CK, recognising that technology can represent and convey content in unique ways.	Integrating in-built dictionaries into e-readers, facilitating instant vocabulary lookup during reading tasks.
Pedagogical Content Knowledge (PCK)	Knowledge related to the teaching of specific content.	Combines CK and PK to develop tailored instructional strategies for specific content.	Using prompts of strategic questions to enhance comprehension while students complete guided reading tasks.
Technological Pedagogical Content Knowledge (TPACK)	Knowledge related to the integration of technology into teaching practice, combining CK, PK, and TK.	Ability to select technology tools that support content and strategies while benefiting teaching and meeting student needs.	Incorporating a digital platform like Canva Whiteboard where students listen to audio recordings, read transcripts, and write reflections as a group collaboratively.

Table 2.1 shows the seven knowledge domains of the TPACK framework with examples of how teachers would use the knowledge in an instructional context. Overall, the TPACK framework provides a valuable framework for understanding the knowledge and skills needed by teachers to integrate technology into their teaching practice. By recognising the interplay between content knowledge, pedagogical knowledge, and technological knowledge, the framework provides a comprehensive approach to teaching with technology (Schmidt et al., 2009). Teachers who possess TPACK are better equipped to identify and select appropriate technology tools and resources, and to use these tools in a way that is most suitable for the teaching while also meeting the needs of their students (Harris & Hofer, 2014; Mishra & Koehler, 2006).

2.2.2 Adult Learning Theory

The Adult Learning Theory formulated by Malcolm Knowles proposes that the learning processes of adults are different from those of children, and have six fundamental principles: a need to know, understanding the reason for learning; self-concept, thriving in learning when given autonomy; learner’s experience, building upon past experiences; readiness to learn, engaging when it solves present problems; orientation to learning, prioritising specific and non-generic learning; and motivation to learn, focusing on learning that has values (Knowles, 1978). This perspective informs the present study's examination of teachers' readiness, in terms of their teacher knowledge, specifically TPACK, to integrate technology into their teaching practices, and the factors determining that knowledge.

Knowles developed the Adult Learning Theory drawing influences from several pioneers of learning and adult education. One of them was Eduard Lindeman who believes that adult learners are need-driven, life-centred, based on life experiences, need to be selected and vary according to age (Lindeman, 1926). Another influence was the Experiential Learning Theory (Dewey, 1938; Rogers, 1983) which champions that learning is best facilitated when learners have autonomy over the selection of the content that is relevant and practical to them, and actively participate in the process of learning and assessing their own progress. Furthermore, in the Theory of Human Motivation Maslow's (1943) hierarchy of needs also provided Knowles with a framework for comprehending motivation in adult learning. The Adult Learning Theory asserts that adults learn best when they understand the benefits of learning when it is relevant (Knowles, 1984). In comparison to younger learners, this understanding in adult learners is shaped by the wealth of life experiences, which influence learning interests, motivations, and goals, and condition their readiness to learn, primarily when the learning is immediately applicable to their environment (Merriam & Bierema, 2014). Unlike younger learners, who often follow a predetermined learning path set by teachers, adult learners have the capacity and preference to direct their own learning. They set their own learning objectives based on their needs and interests, often inclining towards contents that are relevant to their immediate environment. This self-guided approach results in a task-centred orientation to learning, underlining the importance of addressing and solving real-world problems they frequently encounter (Knowles, 1984). Furthermore, adult learners benefit from a degree of individualisation within their learning process, as they differ from younger learners in terms of their ability to work autonomously, choosing not only the way they learn but also what they need. Finally, adult learners are primarily driven by intrinsic motivations such as self-fulfilment and the desire for knowledge (Wlodkowski, 2008).

2.3 Teacher Knowledge

Teacher knowledge is complex as it comprises a wide scope of understandings, skills, and dispositions to support students' learning and development of skills (Shulman, 1986). The investigation into teacher knowledge is integral for the improvement of teacher education as it helps in designing and implementing training and professional development programs to cater to what teachers need or lack (Darling-Hammond & Bransford, 2005). The theory of teacher knowledge, described as Pedagogical Content Knowledge (PCK) was introduced by Shulman (1986), stating that Content Knowledge (CK), Pedagogical Knowledge (PK), and the unique blend of these two knowledge domains are essential for teaching. Shulman describes PCK as a teacher's understanding of how content and subject matter can be transformed into a form that is comprehensible for learners, basing decisions on the learners' prior knowledge, misconceptions, and how they learn. This makes it a necessity for teachers to not only understand the subject matter thoroughly but also be competent in pedagogical strategies and methodologies to convey content to learners (Shulman, 1987). This challenged the popular prior belief that teacher knowledge was principally and predominantly the teacher's expertise in the subject matter (Grossman, 1990) as the notion of PCK emphasised the significance of pedagogical knowledge working simultaneously and intertwined with the content area knowledge (Shulman, 1987). As part of PCK, Shulman (1986) also highlighted the importance of having curriculum knowledge for teaching, A teacher is required to have content knowledge of the curriculum which includes the structure and content of textbooks, syllabi, and instructional materials, and non-curricular aspects of values and norms that learners should learn through the curriculum for informed decision-making (Shulman, 1986). In addition to that, Shulman also added that a teacher needs to have curriculum knowledge, which is the understanding of objectives, purposes, aims, and values as another crucial component of teacher knowledge. This dimension encompasses the ethical and moral component of teaching whereby teacher has the awareness and can justify their pedagogy as beneficial to the learners and the community (Shulman, 1986). Other than the knowledge of “what” and “how” to carry out classroom instructions best, PCK also outlined the bigger picture of contextual knowledge whereby teachers need to be aware of “where” the teaching and learning would occur, to navigate and act within the specific social, cultural and institutional factors they are working in (Shulman, 1987).

Other perspectives on teacher knowledge can be seen through the Core Reflection Approach (Korthagen, 2017) and the inquiry-oriented approach (Cochran-Smith & Lytle, 1999) which focuses on the importance of teacher reflection, inquiry, and collaboration to develop and expand existing teacher knowledge. Different from Shulman’s PCK which focuses on the substance of teacher knowledge, these approaches place emphasis on the vital role of ongoing reflection, inquiry, and collaboration in the process and development of teacher knowledge. The Core Reflection Approach looks into the idea that teachers need to continuously reflect on their beliefs, values, and identity other than their PCK, following the levels of environment, behaviour, competencies, beliefs, identity, and mission to identify areas to improve on (Korthagen, 2017). The inquiry-oriented approach suggests that teacher knowledge which is generated in the context of continuous inquiry and collaboration can better meet the needs of diverse learners (Cochran-Smith & Lytle, 1999). Although it may prove to be valuable to draw on multiple perspectives on teacher knowledge, selecting the most appropriate framework or approach relies heavily on the goals and context of a situation.

2.3.1 Assessing Teachers' TPACK

Assessing teacher knowledge has always been a challenge as it is a complex combination of many aspects including content knowledge, pedagogical knowledge, contextual knowledge (Shulman, 1987), and the dynamic synthesis of these aspects (Cochran-Smith & Lytle, 1999), making it no easy feat to be effective and objective (Ball et al., 2008). Despite the challenge the task presents, assessing teachers' knowledge is vital in the effort to understand their readiness and ability to integrate technology into their teaching. The TPACK framework provides a comprehensive look at the seven knowledge domains separately and TPACK as a whole (Koehler et al., 2013), which makes it the best fit for professional development or teacher–learning planning. The TPACK framework has been used to assess or examine teacher knowledge through various methods.

One of the methods is by using self-report measures in the form of TPACK questionnaires whereby teachers rate themselves on items in various knowledge domains. A widely used instrument is the TPACK questionnaire developed by Schmidt et al. (2009) using forty seven items on a five-point Likert scale to assess teachers' perception of their knowledge in the seven TPACK domains. The instrument has been proven reliable and valid in multiple studies (Chai et al., 2011) and has been adapted into several variations to fit the context and subject areas of the studies. Observational measures are also used in TPACK lesson plan analysis which involves examining lesson plans to identify teachers' TPACK integration through a rubric or coding scheme, looking at the presence and quality of TPACK aspects of the lesson plans (Harris et al., 2010). Another observational measure used is classroom observations which involve the documentation of teachers' lessons to assess their TPACK in practice (Singh & Kasim, 2019) through observation protocols (Graham et al., 2009; Kereluik et al., 2011; Yurdakul et al., 2009) so that systematic evidence of TPACK can be examined. The mixed-method approach is another way of examining teachers' TPACK through in-depth examinations by combining multiple data sources through self-report surveys, interviews, lesson plans, and classroom observations, focusing on the unique individual teaching experience to provide rich data for the studies (Creswell, 2010).

2.3.2 TPACK And Technology Integration

Teachers with high TPACK have the advantage of knowledge to provide engaging, interactive, and personalised learning for students, which in turn can lead to better academic performance and learning outcomes (Mishra & Koehler, 2006). While it can pose a challenge to gauge the effectiveness of a teacher's technology integration effort and determine whether it benefits learners, an indicator could be student performance. Recent studies have demonstrated implementation of TPACK leads to positive student performance outcomes.

In a study by Akturk and Ozturk (2019), seventy eight teachers and 1597 secondary school students in Turkey participated to investigate the relationship between teachers' TPACK and student outcomes. The study found that the level of teachers' TPACK has more impact on students' academic outcomes compared to students' social and emotional self-efficacy, highlighting the importance of teachers' TPACK knowledge for technology integration.

Another study was conducted by Atun and Usta (2019) to examine the effects of a course planned based on the TPACK framework on students' academic performance. The study was participated by 41 middle school students in Turkey and reported that content and pedagogy tailored based on the TPACK improved learners' higher-order thinking skills.

This was also seen in the study by Kamid et al. (2021) which investigated the effectiveness of the TPACK-informed problem-based learning model in mathematics lessons for 128 junior high schools in Indonesia. The study examined two experimental groups and found that the TPACK-informed learning model yielded better student performance, with them scoring higher grades and achieving better learning outcomes compared to students who experienced a learning model that was not designed based on the TPACK framework.

Other than assessing a teacher's knowledge for technology integration, the TPACK framework has served as the structure for various professional development and teacher training initiatives and has been proven to lead to improvements in teachers' knowledge, which in turn contributed towards technology integration in the classroom (Bustamante, 2020; Koh, 2018).

An example is a qualitative study through interviews, classroom observations, and documentation conducted by Bustamante (2020) to explore the effectiveness of professional development based on the TPACK framework of 18 Spanish language teachers in Nebraska. The study reported that TPACK-informed professional development programs and content improved language teachers' pedagogical practices, and their subject matter knowledge and resulted in technology integration. The study concluded that TPACK is an essential framework for the designing of professional development as it connects pedagogy and technology and teachers acquire knowledge and skills to support their technology integration with theoretical foundations in language teaching pedagogy.

Another study by Koh (2018) reported that the usage of TPACK design scaffolds in professional development, which included meaningful learning rubrics, lesson design guidelines, and TPACK activity types, helped boost Singaporean teachers' TPACK confidence in making pedagogical changes when designing lessons. By familiarising teachers with conceptions of the TPACK framework and demonstrating how they can support student-centred learning, the course in the study successfully facilitated teachers in creating engaging lesson plans with technology integration.

To summarise, these studies on TPACK and technology integration highlight the vital role that TPACK plays in enhancing both teaching practices and student outcomes. Across the studies, a consistent finding is that teachers with a strong grasp of TPACK are better equipped to deliver engaging, interactive, and personalised instruction, which directly leads to improved student performance. For instance, Akturk and Ozturk (2019) found that teachers' TPACK levels significantly influenced students' academic outcomes, surpassing the effects of social and emotional factors. This indicates that TPACK is a crucial factor in effective teaching within technology-integrated environments.

Similarly, Atun and Usta (2019) demonstrated that TPACK-informed pedagogy not only improves general academic performance but also enhances higher-order thinking skills, highlighting the framework’s ability to support more complex cognitive development. This aligns with the findings of Kamid et al. (2021) where a TPACK-informed learning model led to higher grades and better learning outcomes compared to non-TPACK approaches. These studies collectively show that TPACK is beneficial across various subjects and educational contexts, consistently leading to superior educational outcomes.

In addition to its impact on students, TPACK has been shown to significantly enhance teachers' pedagogical practices and confidence. Bustamante (2020) and Koh (2018) both found that professional development programmes based on the TPACK framework effectively improved teachers' instructional strategies and their ability to integrate technology into their lessons. Bustamante highlighted improvements in language teachers' content knowledge and pedagogical skills, while Koh demonstrated how TPACK scaffolds could boost teachers' confidence in designing technology-enhanced lessons.

Overall, these studies indicate a strong agreement that TPACK is an essential framework for both teacher development and student success. Teachers with high TPACK are more capable of creating meaningful, technology-integrated learning experiences, which are crucial in modern educational settings. The consistent positive outcomes across different studies and contexts highlight the effectiveness of TPACK as a guiding framework in education.

2.3.3 TPACK of English Language Teachers

In the context of English language teaching, teachers' TPACK would involve specifically their CK, TCK, PCK and TPCK in the English language teaching and learning. Various studies have been done to examine teachers' TPACK in the context of English language education. Table 2.2 shows a summary of the findings of these studies.

Table 2.2: Past Studies of Examining Teachers' TPACK in The English Language Education Context

Title	Author, Year & Sample	Findings	Method
Tracing pre-service English language teachers' perceived TPACK at sophomore, junior, and senior levels.	Turgut, (2017) Pre-service English language teachers in Turkey	Pre-service teachers with more years of training experience scored significantly higher scores in PCK and PK. Teachers with less experience scored significantly higher in TK, TPK, TCK, and TPCK. Pre-service teachers gained more mastery of how to incorporate technology into pedagogy with content, resulting in a more balanced TPACK. Experienced pre-service teachers and beginner teachers both expressed have different professional development programs that fit their specific needs	Mixed (online questionnaire by Schmidt et al. (2009), class interviews)

Table 2.2 continued

Investigating English language teachers in developing TPACK and multimodal literacy	Drajati et al. (2018) Pre-service and in-service English language teachers in Indonesia	Pre-service teachers have a high level of TPACK Teachers are familiar with technology but lack knowledge of how to integrate it into their teaching. Novice teachers showed more variety in tool usage compared to pre-service teachers, and teachers with more than ten years of experience, but age and experience do not significantly influence TPACK.	Mixed method (online questionnaire, class observation, interviews)
Perceptions of Turkish Pre-Service EFL Teachers on Their Technological Pedagogical Content Knowledge	Işler and Yıldırım, (2018) Pre-service English language teacher in Turkey	A high level of TPACK was reported. Teachers recognise the importance of technology integration but have varying intentions of usage – depends on the teacher's interest, experience, mentor teacher's guidance, knowledge, and technology access.	Quantitative (questionnaire by Kabakçı-Yurdakul et al. (2012), interview focusing on how and extent of technology integration)
Information Communication Technologies in Teaching English as Foreign Language: Analysing EFL Teachers' TPACK in Czech Elementary Schools.	Paneru, (2018) In-service English language teachers in Czech	Teachers who developed their TPACK through the conventional formal practice method find it challenging to transfer rote knowledge to practice. Teachers who developed TPACK through functional practice by integrating technology as collaborative tools showed an increase in creative potential.	Qualitative (interview)
Evaluating novice and Iran experiences EFL teachers' perceived TPACK for their professional development.	Nazari et al. (2019) In-service English language teachers in Iran	Teachers with more experience have higher PK and PCK, and beginner teachers have higher TK, TCK, TPK and TPCK but no significant differences in TPACK. Beginner teachers develop TK to improve TPACK, while experienced teachers develop PK and CK to improve theirs. Beginner and experienced teachers develop TPACK differently based on their professional needs.	Mixed method (questionnaire (Baser et al. 2016), interview)
Pre-service Teachers' Mastery of Technological Pedagogical Content Knowledge for Teaching English Language	Singh and Kasim, (2019) Pre-service English language teachers in Malaysia	Pre-service teachers showed good understanding and mastery of TPACK. Good ability to integrate technology effectively.	Qualitative (case study)
Level of ESL Teachers' Technological Pedagogical Content Knowledge (TPACK) Skill and Attitude towards Technology	Azhar and Hashim, (2022) In-service English language teachers in Malaysia	Teachers have a high level of TPACK and showed the highest CK compared to other knowledge domains. Teachers have a positive attitude towards technology integration. Gender does not result in a significant difference in TPACK. Teaching experience results in a significant difference in attitude and TPACK level – not specified which is higher.	Quantitative (questionnaire (Baser et al. 2016) for TPACK, Yavuz (2005) for attitude towards technology)

From these studies, several key conclusions can be drawn about the TPACK of English language teachers and their knowledge of technology integration.

First, the development of TPACK among English language teachers is significantly influenced by their level of experience. For example, Turgut (2017) and Nazari et al. (2019) found that beginner teachers often have higher levels of Technological Knowledge (TK) and related areas such as Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPCK). In contrast, more experienced teachers tend to have stronger Pedagogical Knowledge (PK) and Pedagogical Content Knowledge (PCK). This suggests that beginner teachers focus mainly on developing technological skills, while experienced teachers refine their ability to combine pedagogy and content, leading to a more balanced TPACK as they progress in their careers.

Second, despite generally high levels of TPACK, many teachers, both pre-service and in-service, struggle to integrate technology effectively into their teaching practices. This challenge is particularly evident in the findings of Paneru (2018) and Drajati et al. (2018), which show that teachers who developed their TPACK through conventional, formal methods often stress rote learning over practical application. The findings highlight the importance of adopting more practical, hands-on approaches that encourage creative and collaborative use of technology in the classroom, as these methods have been shown to improve teachers' ability to apply their TPACK in real-life situations.

Third, the need for targeted professional development is also clear from the analysis. Studies by Turgut (2017) and Nazari et al. (2019) suggest that both beginner and experienced teachers require different types of support to strengthen their TPACK. Beginner teachers may benefit from programmes that focus on developing their technological skills, while experienced teachers may need opportunities to deepen their pedagogical and content integration. Tailoring professional development to these distinct needs can help teachers at different stages of their careers enhance their overall ability to integrate technology effectively into their teaching.

Fourth, teachers' intentions and practices regarding technology integration vary widely, influenced by factors such as personal interest, teaching experience, mentorship, and access to technology. This is evident in the findings of Işler and Yıldırım (2018) and Azhar and Hashim (2022), which show that while teachers may have the knowledge and skills, their actual use of technology in teaching is shaped by these external influences.

Finally, the studies showed that English language teachers generally have positive attitudes towards technology integration and recognise its importance in modern education. However, these positive attitudes do not always lead to effective practice. This gap between perception and practice, as highlighted by studies such as Singh and Kasim (2019) and Azhar and Hashim (2022), suggests that while teachers value technology, they often need more support and guidance in applying it within their teaching frameworks. Addressing this issue through targeted interventions could help bridge the gap and ensure that teachers are not only knowledgeable about TPACK but also capable of using technology to enhance student learning.

Other than that, when compared to the studies done on non-English language teachers, the findings done on English language teachers showed three main similarities.

Firstly, the studies on English language teachers also showed the positive influence of TPACK on teaching practices and student outcomes. The studies on English language teachers show that teachers with a strong grasp of TPACK are better equipped to integrate technology into their teaching, which improves their ability to deliver engaging, interactive lessons

Secondly, the studies on English language teachers also highlighted the critical role of professional development in enhancing TPACK. Both beginner and experienced teachers benefit from targeted professional development that addresses their specific needs (Nazari et al., 2019; Turgut, 2017).

Thirdly, these studies also highlighted the struggle to effectively integrate technology into teaching. Similar to the findings of the studies that were done on non-English language teachers, even teachers with high TPACK levels often face challenges in applying their knowledge practically, especially when their TPACK was developed through conventional methods (Drajati et al., 2018; Paneru, 2018).

The findings from the studies on English language teachers also showed several differences when compared to those on TPACK and technology integration in general. One significant difference lies in the focus on student outcomes. While the general TPACK studies, such as those by Akturk and Ozturk (2019), Atun and Usta (2019), and Kamid et al. (2021), emphasise the direct impact of TPACK on student performance and the development of higher-order thinking skills, the studies on English language teachers' TPACK tend to concentrate more on the teachers' development and mastery of TPACK itself. There is less direct emphasis on how these impacts student outcomes in English language teacher studies (Drajati et al., 2018; Turgut, 2017).

Another difference is found in the role of professional development. Although both sets of studies recognise the importance of professional development in enhancing TPACK, the general TPACK studies, like those by Bustamante (2020) and Koh (2018), focus on how TPACK-informed professional development improves teachers' overall pedagogical practices and technology integration skills. In contrast, the studies on English language teachers highlight the specific challenges faced by novice versus experienced teachers and the need for tailored professional development to address their unique needs (Nazari et al., 2019; Turgut, 2017).

The use of technological tools also differs between the two areas of study. General TPACK studies often emphasise the variety and effectiveness of technological tools in enhancing learning across different subjects. However, the studies on English language teachers, particularly by Drajati et al. (2018), point out that while teachers may be familiar with various tools, they often struggle to integrate these tools effectively into their teaching, especially among less experienced teachers.

Contextual factors influencing technology integration are another area where differences emerge. General TPACK studies typically discuss technology integration within broader educational contexts, with less focus on individual factors. On the other hand, studies on English language teachers' TPACK, such as those by Işler and Yıldırım (2018) and Paneru (2018), highlight how factors such as personal interest, access to technology, and mentorship significantly impact how teachers perceive and apply their TPACK in the classroom.

Finally, the methodological approaches differ between the two groups of studies. General TPACK research often uses large-scale quantitative studies and experimental designs to measure the impact of TPACK on student outcomes. In contrast, the studies on English language teachers' TPACK frequently use qualitative approaches, including interviews and case studies, to explore teachers' perceptions and experiences in greater depth (Paneru, 2018; Singh & Kasim, 2019).

In summary, while both bodies of research stress the importance of TPACK in education, they differ in their focus. The general TPACK studies are more concerned with student outcomes and broader educational impacts, while the studies on English language teachers focus more on the development and practical application of TPACK within specific teaching contexts.

One aspect that has been widely studied is the relationship between experience and the development of TPACK. Research by Turgut (2017) and Nazari et al. (2019) shows that pre-service teachers tend to have higher levels of Technological Knowledge (TK) early in their training, but as they gain more experience, their Pedagogical Knowledge (PK) and Pedagogical Content Knowledge (PCK) improve, leading to a more balanced TPACK. This indicates that while novice teachers may be more familiar with the latest technological tools, experienced teachers are better at integrating these tools into their teaching due to their stronger pedagogical foundations.

Another frequently studied area is the impact of professional development on TPACK. Studies by Drajati et al. (2018) and Singh and Kasim (2019) highlight that both pre-service and in-service teachers benefit from tailored professional development programmes. These programmes help teachers refine their ability to integrate technology effectively into their pedagogy, although the studies also point out that many teachers still struggle with the practical application of technology in the classroom, even when they possess a strong theoretical understanding of TPACK.

However, certain aspects of TK are less understood, particularly the specific challenges teachers face in integrating technology into their teaching practices. For example, Paneru (2018) found that teachers who developed their TPACK through conventional, formal methods often struggled to apply their knowledge practically. This contrasts with those who used functional practice, such as integrating technology as collaborative tools, who showed greater creative potential. This suggests that while TK is well-understood in theory, its practical application remains a challenge for many teachers.

The studies also reveal variability in how teachers perceive and use technology, influenced by factors such as personal interest, access to technology, and mentorship. Işler and Yıldırım (2018) noted that while teachers generally recognise the importance of integrating technology, their actual use of it varies widely. This variability highlights the need for further research into how these factors impact the effective use of technology in teaching.

Finally, while studies like those by Azhar and Hashim (2022) show that teachers generally have a positive attitude towards technology integration, there is still a gap between their TPACK knowledge and its application in the classroom. Despite high levels of TPACK, the practical challenges teachers face suggest that more targeted support and ongoing professional development are needed to help them fully utilise their technological knowledge in teaching.

2.3.4 Factors Influencing the Development of Teacher Knowledge for Technology Integration

The development of teachers' knowledge of technology integration is important in an educational landscape that is increasingly becoming more and more digitally driven. The quality of learning, be it individually initiated or institution-organised, may often be affected by many factors. These may range from access to technological resources (Ertmer & Ottenbreit-Leftwich, 2010), sustainable professional development with relevant content and needs (Darling-Hammond et al., 2017; Lawless & Pellegrino, 2007), institutional and leader support (Dexter et al., 2017; Hew & Brush, 2007), teachers' pedagogical beliefs

(Ertmer, 2015; Teo, 2011), collaboration with colleagues (Voogt et al., 2015), to contextual factors (Harris & Hofer, 2011). Table 2.3 shows recent past studies on factors influencing development of teacher knowledge for technology integration.

Table 2.3: Factors Influencing the Development of Teacher Knowledge for Technology Integration

Title	Author Year & Sample	Findings	Method
Technological pedagogical content knowledge (TPACK) and the teaching of science: Determiners for professional development	Akun and Mohamad, (2021) In-service Science teachers in Malaysia	High CK, PK, TK, PCK, and moderate TCK, TPK, TPACK. Teachers with more experience have higher CK, PK, and PCK. Novice teachers have higher TK. Suggestion for tailored professional development based on experience levels.	Quantitative Questionnaire adapted from Graham et al. (2009) and Schmidt et al. (2009)
Exploring the role of context and collaboration in normalising technology use in English language teaching	Balchin and Wild, (2020) In-service secondary school English language teachers	Teachers view technology learning as an individual responsibility. They desire decision-making autonomy over technology knowledge development.	Qualitative Interviews
Factors influencing the technological pedagogical content knowledge (TPACK) of English teachers in primary schools, Chiang Mai Primary Educational Service Area 1	Boonsue, (2021) In-service primary school English teachers in Chiang Mai	Technology knowledge is the key determinant of TPACK. Low technology knowledge results in poor technology integration and decreased teacher motivation to learn more and develop TPACK.	Mixed-method Questionnaire, semi-structured interviews
Facilitating pre-service teachers' development of technological, pedagogical, and content knowledge (TPACK)	Chai et al. (2010) Pre-service secondary school teachers in Singapore	Teachers develop TPACK best with experience, hands-on practical application, and customised learning pace and process	Mixed-method Questionnaire adapted from Schmidt et al. (2009), field notes, and classroom observation.
School learning support for teacher technology integration from a self-determination theory perspective	Chiu, (2022) In-service English language teachers	Autonomy in professional development promotes a sustained desire to learn, which contributes to their gaining of knowledge.	Mixed-method, Basic Psychological Needs Scale (revised version) and interviews

Table 2.3 continued

Factors influencing the technological pedagogical content knowledge (TPACK) among TVET instructors in Malaysian TVET Institution	Chua and Jamil, (2012) In-service teachers in TVET institutions in Malaysia	Gender and expertise areas do not affect TPACK development. Organisational, personal, socio-psychological, and student-related factors significantly determine TPACK enhancement. Experience plays a crucial role through experiential & problem-based learning.	Mixed-method Questionnaire adapted from Lux, (2010), Schmidt, Baran et al., (2010), Nurhayati, (2006), Siti Atiqah, (2008) interviews
Exploring the structural relationship among teachers' technostress, technological pedagogical content knowledge (TPACK), computer self-efficacy, and school support.	Dong et al. (2019) In-service primary and secondary school teacher in China	Collegial support positively affects teachers' TPACK. Working with other teachers proves more effective for TPACK development than formal technical training.	Quantitative Questionnaire adapted from Sang et al., 2016
Technological pedagogical content knowledge (TPACK) in action: A descriptive study of secondary teachers' curriculum-based, technology-related instructional planning	Harris and Hofer, (2011) In-service teachers in the United States	Teacher development of TPACK is influenced by the context of teaching, school organisational structures, availability of resources, curriculum content, student engagement, teacher's past experience, and teacher expertise.	Qualitative Interviews, unit plans, reflections on lesson plans
Mobilisation and enactment of Malaysian ESL teachers' technological pedagogical content knowledge	James and Lee, (2020) In-service Malaysian English language teachers, three teacher coaches	Contextual factors like students, their familiarity with technology tools, proficiency in English, etc., influence teachers' technology integration.	Mixed-method Questionnaire, written reflections of teachers, and interviews
TPACK-in-Action: Unpacking the contextual influences of teachers' construction of technological pedagogical content knowledge	Koh et al. (2014) In-service primary school teachers in Singapore	Teacher's TPACK development is influenced by context of instruction, institutional culture, relationship with colleagues, engagement in pedagogical discussions, good IT facilitator, supportive, and beliefs.	Qualitative Observation of teacher discussion
A sequential explanatory investigation of TPACK: Indonesian science teachers' survey and perspective	Muhaimin et al. (2019) In-service high school Science teachers in Indonesia	Teachers' beliefs, self-efficacy, attitudes, acceptance of integration, content, students' needs, instructional conditions, support from school administrators, and knowledge-specific training influence teachers' TPACK development.	Mixed-method Questionnaire & interviews

Table 2.3 continued

Evaluating novice and experienced EFL teachers' perceived TPACK for their professional development	Nazari et al. (2019) In-service English language teachers in Iran	Novice teachers have better technological-based knowledge. Experienced teachers have better pedagogical-based knowledge. Both groups prefer tailored professional development and believe in collaborative learning between the two groups	Mixed-method Questionnaire adapted from Baser et al., 2016, interview
Mathematics Teachers' Knowledge-of-Practice with Technologies in an Online Masters' Program: Scoop Action Research Experiences and Reflections	Niess and Gillow-Wiles, (2019)	Teachers' TPACK was enhanced through professional development programs focusing on technology integration within specific subject areas. Such programs should be aligned with the curriculum.	Qualitative Cross-case study using Scoop Notebook notes
Malaysian English Language Teachers' Agency in Using Digital Technologies During the Pandemic: A Narrative Inquiry	Zainal and Zainuddin, (2021) In-service secondary school English language teachers	Teachers desire autonomy in the development of their knowledge for technology integration.	Qualitative Interviews

From the studies, seven main factors were found to be determining teachers' TPACK level. The factors most cited are, organisational factors which were reported in three studies (Chua & Jamil, 2012; Dong et al., 2019; Koh et al., 2014), autonomy and individual responsibility in three studies (Balchin & Wild, 2020; Chiu, 2022; Zainal & Zainuddin, 2021), student factors in three studies (Chua & Jamil, 2012; James & Lee, 2020; Koh et al., 2014), teacher experience in two studies (Akun & Mohamad, 2021; Chai et al., 2010), focused professional development in two studies (Chai et al., 2010; Niess & Gillow-Wiles, 2019), technological knowledge and resources in two studies (Boonsue, 2021; Harris & Hofer, 2011), and beliefs, attitudes, and self-efficacy in two studies (Muhaimin et al., 2019; Nazari et al., 2019).

2.3.4.1 Organisational Factors

The organisational and contextual factors also wield considerable influence over TPACK development. Chua and Jamil's (2012) study found several determinants, ranging from organisational structures and personal motivations to socio-psychological elements that play a part in TPACK enhancement among Malaysian TVET institutions' teachers. Similarly, Koh et al. (2014) also found institutional culture and peer relationships to be catalysts for teacher's learning. Dong et al.'s (2019) study added to this narrative, showing that for primary and secondary school teachers in China, collegial support was a more potent catalyst for TPACK development than even formal technical training.

2.3.4.2 Autonomy and Individual Responsibility

Autonomy and individual responsibility in technology integration also were identified as key factors which influenced TPACK development. Balchin and Wild's (2020) study with in-service secondary school English teachers found an inclination towards viewing technological learning as an individual responsibility. These teachers emphasised the value of decision-making autonomy in the realm of their technological knowledge development. This sentiment was echoed by Chiu (2022), who discovered that granting in-service English language teachers' autonomy in their professional development and training fosters a lasting motivation to learn. This desire for autonomy, especially in knowledge development for technology integration, was further supported by the findings of Zainal and Zainuddin (2021) among secondary school English language teachers in Malaysia.

2.3.4.3 Student Factors

The studies by Chua and Jamil (2012), James and Lee (2020), and Koh et al. (2014) further emphasised the importance of factors like students' familiarity with technological tools, along with other student-related aspects such as interest and access, in the development of TPACK.

2.3.4.4 Teacher Experience

Teachers’ experience and professional development play a pivotal role in shaping teachers' TPACK. Akun and Mohamad's (2021) study among in-service science teachers in Malaysia accentuated that those with more teaching experience tend to have superior content, pedagogical, and pedagogical content knowledge. Conversely, beginner teachers appear to have a stronger grasp of technological knowledge. Furthermore, Chai et al.'s (2010) research on pre-service secondary school teachers in Singapore also showed that experience, when enforced with hands-on practical application and a personalised learning trajectory, emerges as a critical factor for TPACK's development.

2.3.4.5 Focused Professional Development

Niess and Gillow-Wiles' (2019) study further corroborated the findings by Chai et al (2010), suggesting that targeted professional development programs, especially those focusing on technology integration within specific subjects like Mathematics, can significantly bolster TPACK, compared to generic training.

2.3.4.6 Technological Knowledge and Resources

In addition, the importance of technological knowledge and resources was also spotlighted in several studies. A study by Boonsue (2021) highlighted that the lack of technological knowledge was not just an hindrance to TPACK development but also led to ineffective technology integration and dampened enthusiasm to enhance teachers’ TPACK. Harris and Hofer's (2011) study broadened this perspective, pointing out that the availability of resources, coupled with the teaching context and school organisational structures, has a tangible impact on the TPACK development trajectory among teachers.

2.3.4.7 Beliefs, Attitudes, and Self-Efficacy

Lastly, the role of Beliefs, Attitudes, and Self-Efficacy cannot be understated. Muhaimin et al.'s (2019) study among high school science teachers in Indonesia laid bare the strong undercurrents of teachers' beliefs, attitudes, and acceptance of technology integration in influencing their TPACK trajectories. Interestingly, Nazari et al.'s (2019) research unveiled a dichotomy in Iran: while novice English language teachers displayed superior technology-based knowledge, their experienced counterparts excelled in pedagogical-based knowledge. Yet, both cohorts saw eye to eye on the value of collaborative learning.

To summarise across findings, no lone factor was found in all the studies. Numerous factors impact TPACK such as the background of teachers, subject matter, institutional environment and wider technological landscape backdrop when the study was done. Again, different studies are carried out in various educational contexts including countries and levels of education, for instance primary, secondary and higher, characterised by different technological infrastructures and hence leading to the adoption of diverse determinant variables.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The study investigates English Language teachers' readiness in integrating technology into English language lessons under the CEFR-aligned curriculum specifically in terms of Technological Pedagogical Content Knowledge (TPACK). This chapter describes the methodology that will be undertaken in carrying out the present study. The chapter is divided into seven sections. The research design is outlined in Section 3.2 while Section 3.3 sets out the sampling of the study. Section 3.4 presents the instruments for data collection and the reliability and validity of the instruments for the context of this study. Next, Section 3.5 details the procedures of data collection, and Section 3.6 elaborates on the data analysis procedures. Section 3.7 details the ethical considerations of the study and finally, Section 3.8 explains the limitations of the current study.

3.2 Research Design

This study adopted the mixed-methods research design, combining the strength of the quantitative and the qualitative methods in research, which is the ability to obtain a focused, and standardised format of data, and at the same time recognising how information differs depending on the context it was obtained from (Creswell, 1994; Tashakkori & Teddlie, 2013). To be more specific, the sequential mixed method was applied whereby general findings from a larger sample of a population through the quantitative questionnaire were later explored in detail, focusing on a few individuals through the qualitative questionnaire (Creswell, 2003). The participants completed a questionnaire and answered interview questions on factors affecting readiness. The mixed methods were used because there are two types of data needed, which are numerical data for the level of readiness, and textual data for the factors affecting readiness. There are also two types of data analysis involved. Sstatistical analysis for the level of readiness, and thematic analysis for the factors affecting readiness. Thematic analysis was applied to identify, analyse, and interpret patterns from the qualitative data (Braun & Clarke, 2006). The teachers' level of readiness was measured first by identifying their TPACK self-efficacy level through a quantitative measure of a questionnaire, and then further exploration through a qualitative measure of the interview was made to study how their TPACK self-efficacy level was developed or hindered. This enabled the study to identify specific factors determining teachers' TPACK.

3.2.1 Conceptual Framework

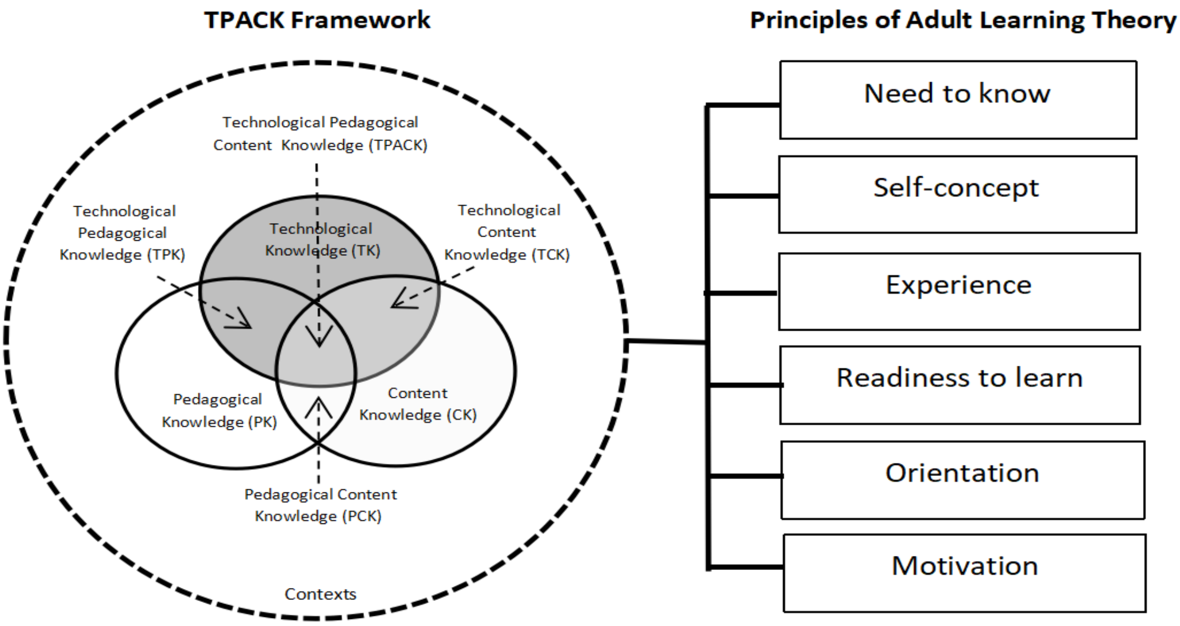

Figure 3.1: *Conceptual Framework of The Study*

The conceptual framework of the present study is shown in Figure 3.1. The research aims to investigate teacher readiness in terms of Technological Pedagogical Content Knowledge in integrating technology among English language teachers in the northern region schools in Sarawak and to identify the factors that determine their

Technological Pedagogical Content Knowledge. This is done by grounding the study in a framework that combines the TPACK framework, and the principles of Adult Learning Theory. At the core of this study, the TPACK framework provides a systematic guide looking at the “what” of teachers’ level of readiness for technology integration. This was done for all seven knowledge domains of TPACK which are TK, PK, CK, TPK, TCK, PCK, TPCK. Building on the knowledge of what they know or lack, to better understand the “why” and “under what circumstances”, the study investigated further based on the principles of the Adult Learning Theory, drawing in-depth responses of participants that contributed insights to factors that determine teachers’ knowledge for technology integration.

3.3 Sampling

There are two sets of sampling criteria for the study as it is a mixed-method study combining questionnaire participant sampling, and interview participants sampling. Purposive sampling was done for both the qualitative and quantitative part of the study, whereby the participants were strategically chosen based on specific criteria, ensuring the sample represents desired characteristics relevant to the research question (Etikan et al., 2016). This targeted approach enables the present study to generate in-depth, contextualised insights by focusing on specific subsets of the teacher population, ultimately enhancing the external validity of the study (Palinkas et al., 2015).

3.3.1 Questionnaire Participants Sampling

For the quantitative part of the study, participants had to meet the following criteria:

1. teaching in a secondary school
2. teaching English language lessons

The participants of this study are 201 English language teachers from twenty eight secondary schools across Sarawak. All teachers participated voluntarily. Sampling was done from the four districts in the same zone under the same state education administration as it is vital to sample study participants with analogous work contexts, resources, and professional training and support to ensure accurate, reliable, and generalisable findings (Creswell & Clark, 2017). By maintaining these commonalities, the study can better control potential variables, which in turn strengthens the internal validity of the study (Shadish et al., 2002). Moreover, this homogeneity among participants' training, access to resources, and educational policies enable clearer identification of causal relationships (Maxwell, 2004). Selecting participants from the comparable context of Sarawak secondary schools also enhances the relevance and applicability of research outcomes, thus proving instrumental for evidence-based decision-making and the development of targeted interventions in the respective professional fields (Polit & Beck, 2017).

3.3.2 Interview Participants Sampling

For the interview, purposive sampling was carried out to determine the teachers who would be the interview respondents.

For the qualitative part of the study, participants had to meet the following criteria:

1. had responded to the questionnaire
2. consented to an individual interview
3. fall under a specific TPACK level category after analysis of the questionnaire responses

The analysis of the quantitative data revealed that teachers fall under the three levels of moderate (M=2.60-3.39), high (M=3.40-4.19), and very high (M=4.20-5.00) levels of TPACK. Notably, no teachers reported very low or low TPACK. Among the respondents who consented to participate in an individual interview, twenty-four teachers were selected, with eight chosen from each TPACK level. This selection was made to ensure equal representation across the groups, as eight was the smallest number of participants who had consented from any level. By maintaining an equal number of participants from each group, the study aimed to gather information from teachers with varying levels of TPACK without introducing bias towards any particular group.

Table 3.1: Characteristics of Interview Respondents (N = 24)

Name (Pseudonym)	**TPACK Mean Score**	**Individual TPACK Level**	**Age (Years Old)**	**Gender**	**English Language Teaching Experience (Years)**
Amy	4.98	Very High	36 to 45	Female	16 to 25
Brian	4.77	Very High	36 to 45	Male	6 to 15
Chai	4.74	Very High	46 to 55	Female	26 to 35
Diya	4.60	Very High	36 to 45	Female	6 to 15
Emma	4.59	Very High	26 to 35	Female	6 to 15
Farah	4.28	Very High	36 to 45	Female	6 to 15
Gary	4.28	Very High	46 to 55	Male	16 to25
Han	4.25	Very High	26 to 35	Male	6 to 15
Ismail	4.08	High	46 to 55	Male	6 to 15
June	3.81	High	36 to 45	Female	6 to 15
Kim	3.78	High	26 to 35	Female	1 to 5
Lee	3.77	High	26 to 35	Female	6 to 15
Meera	3.70	High	26 to 35	Female	1 to 5
Nisa	3.63	High	26 to 35	Female	1 to5
Olivia	3.61	High	36 to 45	Female	6 to 15
Putri	3.45	High	46 to 55	Female	16 to 25
Qaseh	3.39	Moderate	46 to 55	Female	26 to 35
Rhonda	3.30	Moderate	46 to 55	Male	16 to 25
Siti	3.28	Moderate	26 to 35	Female	6 to 15
Tiong	3.18	Moderate	46 to 55	Female	26 to 35
Umaira	3.09	Moderate	46 to 55	Female	26 to 35
Vivek	2.98	Moderate	36 to 45	Female	6 to 15
Wong	2.80	Moderate	56 and above	Female	26 to 35
Xiao	2.67	Moderate	56 and above	Male	16 to 25

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39*), High *(M=3.40-4.19*), Very High *(M=4.20-5.00*)

3.3.3 Characteristics of Interview Respondents

The information of the interview respondents is shown in Table 3.1. Names have been changed and pseudonyms were used to address interview participants for this study. There were twenty four interview participants, eighteen female and six male. The participants consisted of seven teachers aged between twenty six to thirty five years old, seven from the thirty six to forty five age range, eight between the forty six to fifty five years old range, and two aged fifty six and above. three of the teachers have one to five years of English language teaching experience, eleven of them six to fifteen years, five of them sixteen to twenty five years, and five of them have twenty six to thirty five years of teaching experience.

3.4 Data Collection Instruments

The present study is a mixed-method study adapting a questionnaire for quantitative data collection and using an adapted semi-structured interview for qualitative data gathering.

3.4.1 Instrument for Quantitative Data Collection

For quantitative data collection, an adapted TPACK questionnaire shown in Table 3.2 was used.

Table 3.2: TPACK Questionnaire for The Study

Knowledge Domains	Items
TK (Technological Knowledge)	I can use basic technological terms (e.g. operating system, wireless connection, virtual memory) appropriately.
	I can adjust device settings such as installing software and establishing an Internet connection.
	I can use peripherals such as a printer, a headphone, and a scanner.
	I can troubleshoot common problems (e.g. connection problems) independently.
	I can create multimedia (e.g. video, web pages, etc.) using text, pictures, sound, video, and animation.

Table 3.2 continued

	I can use Office programs (e.g. Word, PowerPoint, Excel) with a high level of proficiency.
	I can create multimedia (e.g. video, web pages, etc.) using text, pictures, sound, video, and animation.
	I can use collaboration tools (e.g. Padlet, Google Classroom, Wikispaces, Flipgrid) in accordance with my objectives.
	I can learn software that helps me complete a variety of tasks more efficiently.
CK (Content Knowledge)	I can express my ideas and feelings by speaking in English.
	I can express my ideas and feelings by writing in English.
	I can understand texts written in English.
	I can understand what I listen to in English
PK (Pedagogical Knowledge)	I can use teaching methods and techniques that are appropriate for a learning environment.
	I can design a learning experience that is appropriate for the level of students.
	I can support students' learning in accordance with their physical, mental, emotional, social, and cultural differences.
	I can collaborate with school stakeholders to support students' learning.
	I can reflect the experiences that I gain from professional development programs to my teaching process.
	I can support students' out-of-class work to facilitate their self-regulated learning.
PCK (Pedagogical Content Knowledge)	I can manage a classroom learning environment.
	I can evaluate students' learning processes.
	I can use appropriate teaching methods and techniques to support students in developing their language skills.
	I can prepare curricular activities that develop students' language skills.
	I can adapt a lesson plan in accordance with students' language skill levels.
TCK (Technological Content Knowledge)	I can take advantage of multimedia (e.g. video, slideshow, etc.) to express my ideas about various topics in English.
	I can use collaboration tools (e.g. Padlet, Google Classroom, Wikispaces, Flipgrid) to work collaboratively with other users of English.
	I can benefit from using technology (e.g. web conferencing and discussion forums) to contribute to communities with users of English.
TPK (Technological Pedagogical Knowledge)	I can meet students' individualised needs by using information technologies.
	I can lead students to use information technologies legally, ethically, safely, and with respect to copyrights.
	I can support students as they use technology such as virtual discussion platforms to develop their higher-order thinking abilities.
	I can manage the classroom learning environment while using technology in the class.
	I can decide when technology would benefit my teaching of specific English curricular standards.
	I can design learning materials by using technology that supports students' language learning.
	I can use multimedia such as videos and websites to support students' language learning.

Table 3.2 continued

TPCK (Technological Pedagogical Content Knowledge)	I can use collaboration tools (e.g. wiki, 3D virtual environments, etc.) to support students’ language learning.
	I can support students as they use technology to support their development of language skills in an independent manner.
	I can use Web 2.0 tools (animation tools, digital story tools, etc.) to develop students’ language skills.
	I can support my professional development by using technological tools and resources to continuously improve the language teaching process

The questionnaire administered consists of two main sections, A and B. Section A consists of three questions to elicit the participants’ demographic information which encompasses gender, age, and professional experience. The demographic information gathered will be analysed to study the relation to the level of teachers’ TPACK. An extra open-ended question was incorporated to obtain insights from participants, collecting information on how they would define technology within the scope of their teaching practices. For Section B of the questionnaire, the instrument used was adapted from the questionnaire developed by Baser et al. (2016) based on Koehler and Mishra’s (2006) TPACK framework of technology integration to assess the TPACK of pre-service EFL (English as A Foreign Language) teachers for educational technology integration. The original survey items were generated through expert interviews and document analysis, and the content validity was established through expert and pre-service teacher reviews. Two rounds of exploratory factor analysis were then conducted, resulting in a final survey that includes thirty nine items across seven TPACK constructs which were distributed as follows: nine TK, six PK, five CK, five PCK, three TCK, seven TPK, and four TPCK items. There are no negative statements in the questionnaire items. A five-point Likert system is selected to assess the seven constructs of TPACK. Each item response is scored with a value of one assigned to strongly disagree, two to disagree, three to neither agree nor disagree, four to agree, and five to strongly agree.

The strongest quality of the TPACK-EFL questionnaire by Baser et al. (2016) that fits the purpose of the present study was that it was developed to assess teachers' knowledge of subject-specific pedagogies and technologies, particularly in the teaching of the English language. The instrument by Baser et al. has been employed in research involving both pre-service and in-service English language teachers. A study by Ho et al. (2019) employed the instrument in their research to collect data on the TPACK of 196 EFL in-service teachers in Taiwan. The items in the instrument have also been adapted and utilised in various studies by Laudari and Prior (2020), Li (2021), Salehi et al. (2021), Sarıçoban et al. (2019), and Vereshchahina et al. (2018). Within the Malaysian context, a study was conducted by Azhar and Hashim (2022) which used the instrument to assess TPACK and attitudes towards technology among in-service ESL teachers in Malaysia.

While both pre-service and in-service teachers need to develop TPACK, the process of developing teachers' TPACK differs whereby pre-service teachers are typically exposed to the TPACK framework during their teacher education programs (Koehler & Mishra, 2009) and often rely on simulated or controlled teaching experiences (Baser et al., 2016). In contrast, in-service teachers may have developed their TPACK through reflection, professional development opportunities, on-the-job experience, and self-directed learning (Yurdakul et al., 2012). Nonetheless, the focus of the current study is not on how teachers develop TPACK, but rather on assessing and understanding teachers' current status of readiness in terms of their Technological Pedagogical Content Knowledge. The instrument by Baser et al. (2016) was selected for its alignment with the study objectives, as it effectively evaluates the TPACK aspects the research aims to explore.

While the TPACK requirements for pre-service and in-service teachers in Malaysia are not entirely identical, they share principal similarities integral to the basis of the present study. In terms of the TPACK requirement of an English language teacher's Content Knowledge (CK), both pre-service and in-service teachers are required to be equipped with a deep understanding of the English language and the teaching content of vocabulary, pronunciation, and the four language skills of reading, listening, writing, and speaking, grammar (Chai et al., 2010). For Pedagogical Knowledge (PK), both pre-service and in-service teachers need to possess knowledge of teaching strategies, classroom management, and assessment practices that are suitable for different learner needs and contexts (Voogt et al., 2013). In terms of Technological Knowledge (TK), both pre-service and in-service teachers are expected to be proficient in using various educational technologies and digital tools to support teaching and learning. This includes using technology for lesson planning, content delivery, communication, and assessment.

Table 3.3: Revision of Items in the CK and TCK component

Item	Original	Revised
CK4	I can understand the speech of a native English speaker easily	I can understand what I listen to in English
CK5	I can read texts written in English with the correct pronunciation	Removed
TCK2	I can use collaboration tools (e.g. Second Life, wiki) to work collaboratively with foreign persons.	I can use collaboration tools (e.g. Padlet, Google Classroom, Wikispaces) to work collaboratively with other users of English.
TCK3	I can benefit from using technology (e.g. web conferencing and discussion forums) to contribute at a distance to multilingual communities.	I can benefit from using technology (e.g. web conferencing and discussion forums) to contribute to communities with users of English.

A pilot study was conducted to adapt the EFL-TPACK instrument by Baser et al. (2016) for use with Malaysian secondary school English language teachers and to examine its reliability and validity. The final adapted instrument consisted of thirty eight items, which were distributed as follows: nine TK, six PK, four CK, five PCK, three TCK, seven

TPK, and four TPCK items. The pilot was also conducted to trial the data collection and analysis procedure. The revised items for the items in the CK and TCK components following the pilot study, are presented in Table 3.3.

As the original instrument by Baser et al. (2016) was designed for the EFL context, certain items pertaining to EFL strategies and skills were adapted to better suit the ESL context of the present study. In the CK component, an item assessing listening comprehension was modified from "I can understand the speech of a native English speaker easily" to "I can understand what I listen to in English" Another CK component item, "I can read texts written in English with the correct pronunciation" was removed. This is because, rather than comparing students' proficiency and mastery to that of native English speakers, especially in the school context, the CEFR-aligned curriculum emphasises students' ability to communicate effectively as non-native English speakers, utilise correct grammar, acquire good working vocabulary, express thoughts fluently, interact appropriately, and produce English content that is both comprehensible and articulate (Council of Europe, 2001; Ministry of Education Malaysia, 2020). This approach encourages English language learners to develop practical language skills for effective communication in various contexts (Van Ek & Trim, 1998). By promoting intercultural understanding and English as a lingua franca, the curriculum accommodates the diversity of English accents and dialects in the globalised world (Crystal, 2003), making understanding native speakers less critical and focusing on facilitating communication across different linguistic backgrounds and cultures (Canagarajah, 2006). Therefore, the two items which focused on native-like competency of the English language were removed as it is irrelevant in the context of the present study.

Similarly, two items in the TCK component, which focused on communication with foreigners and multilingual communities, were adapted to align with the ESL context in Malaysia. The items “I can use collaboration tools (e.g. Second Life, wiki) to work collaboratively with foreign persons” and “I can benefit from using technology (e.g. web conferencing and discussion forums) to contribute at a distance to multilingual communities” were adapted to “I can use collaboration tools (e.g. Padlet, Google Classroom, Wikispaces) to work collaboratively with other users of English” and “I can benefit from using technology (e.g. web conferencing and discussion forums) to contribute to communities with users of English”.

While collaboration with foreigners and contributing to multilingual communities are important skills in a globalised world, the Malaysian English language curriculum primarily aims to nurture learners' linguistic and intercultural competencies (Ministry of Education Malaysia, 2015). In Malaysia, the primary objective of English language education is to prepare learners for participation in a multilingual and multicultural society within the nation (Ministry of Education, 2013). Malaysia's diverse linguistic landscape comprises not only English but also Malay, Chinese, Tamil, and various indigenous languages. The curriculum, by emphasising inter-cultural understanding and the development of functional language skills across different languages, seeks to foster harmony and mutual respect among Malaysia's diverse communities (Ministry of Education Malaysia, 2020). Furthermore, the CEFR-aligned curriculum acknowledges the importance of English as a lingua franca, recognising that non-native speakers of English outnumber native speakers (Council of Europe, 2012) This globalised view of English shows the need for learners to be versatile in their communication with speakers from various linguistic and cultural backgrounds, rather than striving to emulate native-like language use (Crystal, 2003). As a result, the CEFR-aligned curriculum is geared towards helping learners adapt their language use to different contexts and interlocutors, instead of specifically focusing on collaborative work with foreigners or contributing to multilingual communities at a distance. All the other items which were consistent with the knowledge and skills required of an ESL teacher in a Malaysian classroom were retained.

During the pilot study, one-to-one interviews were also done to better understand three suspicious items (Ryan et al., 2012). The three items were all in the TCK section and had lower correlations with the other items in the scale and would raise the Cronbach Alpha when deleted. The three items were, “I can take advantage of multimedia (e.g. video, slideshow) to express my ideas about various topics in English”, “I can use collaboration tools (e.g. Padlet, Google Classroom, Wikispaces) to work collaboratively with others in English”, and “I can benefit from using technology (e.g. web conferencing, discussion forums) to contribute to communities in English”.

Respondents expressed that the phrases “take advantage of multimedia”, “use collaboration tools”, and “work collaboratively” are too general and they would like more specific instructions on whether it is asking about their creation of multimedia, or the usage of ready-made media. Taking this into consideration, a brief explanation was included in the sub-heading of the questionnaire in the actual study stating that this item may include both the creation of new media and the usage of ready-made digital resources.

3.4.2 Instrument for Qualitative Data Collection

To gain a deeper understanding of the factors determining teachers' TPACK, interviews were conducted to obtain rich qualitative data that would support and complement the results of the qualitative data analysis while further examining participants' experiences, perceptions, and attitudes (Creswell & Clark, 2017). These interviews were performed to identify subtle aspects and intricacies that might not be apparent solely through the data collected from quantitative measures (Maxwell, 2012) and to more comprehensively explore individual experiences, opinions, and judgments that may not be fully captured by solely administering Likert-type questionnaires (Henson, 2002). Additionally, the interviews helped clarify unclear responses and allowed the current study to focus on specific information of interest, thereby enhancing the reliability and validity of the study (Morse, 2003).

Table 3.4: Revision of Items in The Interview Protocol

Question	Present Study Interview Protocol	Interview Protocol (Slutsky, 2016)	Adaptation Made
1	Tell me about your participation in professional development targeting the learning of instructional technology. What were the strengths of that professional development? How could it have been improved?	Tell me about your participation in professional development targeting the use of instructional technology. What were the strengths of that professional development? How could it have been improved?	use -> learning
2	Tell me about the influence other teachers or staff members (may be individuals or students) have on your learning of technology practices.	Tell me about the influence of other teachers or staff members (maybe individuals or students) have on your technology practices.	+ learning of
3	Tell me about the influence of experience outside of the school setting on your learning of instructional technology.	Tell me about the influence of experience outside of the school setting on your use of instructional technology.	use -> learning
4	Do you consider yourself an innovative teacher? Why or why not?	Do you consider yourself an innovative teacher in learning? Why or why not?	+ learning
5	What barriers have you experienced in your attempts to learn to integrate technology in your classroom?	What barriers have you experienced in your attempts to use technology in your classroom?	use -> learn to integrate
6	What supports have you experienced in your attempts to learn to integrate technology in your classroom?	What supports have you experienced in your attempts to use technology in your classroom?	use -> learn to integrate
7	How often do you experiment or take the time to learn a new technology. In what way?	How often do you experiment or take the time to learn a new technology. In what way?	-
8	What more can you tell me about your experiences with learning to integrate instructional technology in your classroom? In education in general?	What more can you tell me about your experiences with instructional technology in your classroom? In education in general?	+ learning to integrate

To collect qualitative data, a semi-structured interview adapted from Slutsky (2016) was employed. The interview protocol contains eight adapted questions as seen in Table 3.4. The semi-structured interview protocol was adapted from the interview protocol of a study by Slutsky (2016) which investigated the factors affecting teachers' technology integration in their lessons. This study opted for a semi-structured interview to better understand individual experiences and perspectives within a context without imposing an excessively rigid structure that might limit interviewees' thought processes (Creswell, 2010).

The changes made in the interview protocol for the present study compared to the one used by Slutsky (2016) primarily focused on refining questions to emphasise the process of learning rather than just using instructional technology. The adaptations made are to guide the participants towards explaining more specifically how they develop and enhance their knowledge of technology integration.

In the first question, the phrase "the use of instructional technology" was changed to "the learning of instructional technology". In the second question, the original question asked about the influence of other teachers or staff on the respondent's technology practices. The revised version adds "learning of" thus focusing more on the educational impact and personal development aspects influenced by peers, rather than merely the practical application of technology. In the third question, similar to the first question, the term "use" was replaced with "learning" when discussing experiences outside of school. In the fourth question, the revised version adds "learning". This was done so the answers would be more focused on their learning instead of the wider scope of being innovative, as questioned by the original item. Question five and question six both questions originally focused on the "use" of technology. They have been modified to discuss the "learning to integrate” technology. This phrasing indicates a deeper exploration into the challenges and supports encountered not just in using, but in learning to integrate technology into teaching practices. In question seven, no changes were made to this question, maintaining a focus on personal initiative in learning new technologies. In question eight, the addition of “learning to integrate” into the question replaces a more general reference to experiences with instructional technology. This again, prompts answers that would elaborate more on what affects the learning, over mere usage.

These adaptations collectively shift the focus from the operational use of technology to a more comprehensive look at how teachers are learning to integrate technologies into their pedagogical practices.

3.4.3 Reliability and Validity

The pilot study mentioned prior, was conducted earlier to adapt the EFL-TPACK instrument by (Baser et al., 2016) for use with Malaysian secondary school English language teachers and to examine its reliability and validity. The study involved twenty secondary school English language teachers from Sarawak, and IBM SPSS 21 was employed for statistical analysis. The Cronbach's Alpha for the instrument was determined to be 0.95, signifying strong reliability. Moreover, all inter-item correlations were positive, which implies convergent validity. The adapted TPACK survey was demonstrated to be both reliable and valid for assessing the TPACK level of English language teachers in the Malaysian secondary school context (Ngu et al., 2022). The pilot study also served as a small-scale trial run (Van Teijlingen & Hundley, 2002). By testing the instrument, methodologies, and procedures, potential issues can be identified and addressed before the full-scale study (Bell & Waters, 2014; Leon et al., 2011). This process helps improve the clarity and comprehensibility of the research instrument, assess the feasibility of the selected sample size, and refine the research design (Baker, 1994). To conclude, the pilot study was conducted to adapt the instrument to the study context and enhance the robustness and generalisability of the study findings.

3.5 Data Collection Procedure

The data collection procedure in this study was conducted in two phases, with the first phase involving the collection of quantitative data and the second phase involving the collection of qualitative data. Before commencing the research process, the researcher obtained permission from the Education Planning and Research Division at the Ministry of Education to carry out the study on public educational premises in Malaysia. The researcher also obtained consent from the authorities of the schools and the teachers participating in the study. To ensure that the participants understood the study purpose and procedures, all participants were provided information about the study, including its objectives and research procedures and the participants were informed of the importance of honesty in their responses to the questionnaire.

The questionnaire was distributed to 227 secondary school English language teachers across the Miri, Limbang, Lawas, and Baram districts via a link to an online Google Form. The participants were given three weeks to complete the questionnaire. The study chose to use online questionnaires as it provides the participants with the flexibility to complete the questionnaire at their own pace and convenience (Creswell & Creswell, 2017). In the second phase of the data collection process, the researchers used purposive sampling to select the participants for the qualitative data collection. Purposive sampling is a non-probability sampling technique that involves selecting participants based on specific characteristics or criteria (Creswell & Creswell, 2017). In this case, the study selected participants based on their responses to the questionnaire. The participants were selected based on their TPACK level reported from the quantitative data analysed, and the interviews were conducted through phone calls. Phone interviews are beneficial in qualitative research as they provide an opportunity to clarify and explore the participant's responses further.

In conclusion, the research employed a combination of quantitative and qualitative approaches for gathering data, allowing for a thorough exploration of the research questions. The initial phase of data collection utilised quantitative sampling, followed by purposive sampling in the subsequent phase. Participants were thoroughly informed about the study objectives and procedures, ensuring the protection of their rights. Adherence to ethical guidelines was maintained during data collection, with the privacy and confidentiality of participants safeguarded throughout the investigation.

3.6 Data Analysis Procedure

3.6.1 Quantitative Data Analysis - Teachers' TPACK Level

The data analysis from the questionnaire provided general information on the subjects' level of readiness for technology integration in terms of TPACK and the data from the interview helped to learn more about the factors determining the teachers' level of TPACK.

The data analysis process for the present study began with the quantitative analysis of the questionnaire data collected through the adapted TPACK instrument. Out of the 227 questionnaires distributed, 201 responses, constituting 88.55%, were completed and subsequently employed for the analysis.

The study employed descriptive and inferential statistics to summarise participants' responses, identify patterns, and draw conclusions about the sample population (Field, 2013). During this stage, means, frequencies, and standard deviations were calculated for all the knowledge components, which included TK, PK, CK, TPK, TCK, PCK, and TPCK. Additionally, an analysis was conducted to explore whether participants' TPACK was differentiated by demographic variables such as age, gender, and working experience. The data obtained from the analysis was subsequently discussed in terms of its significance to the study context.

3.6.2 Qualitative Data Analysis - Factors Determining Teachers' TPACK

After completing the quantitative analysis, the next step involved conducting the qualitative phase by analysing the data obtained from the adapted semi-structured interview. Through thematic analysis, the study was able to uncover better insights and contextual information that may have been missed by the quantitative questionnaire data (Flick, 2014). The thematic analysis of interview responses in this study was conducted according to Braun and Clarke's (2006) model of thematic analysis, which outlined six key steps.

Figure 3.2: *Braun and Clarke's Steps of Thematic Analysis*

First, the data gathered from the interview responses was familiarised by reading and re-reading. This is an example of a transcribed interview response.

> If there is a community that updates regularly, like on Reddit, I learn all the new tricks that I can use in class to help kids learn. I am someone who believes in results the best. I see results posted by the teachers online and I feel like this is a safe bet and I won't be wasting my effort if it can help them perform for sure. I guess I like it more if I have seen success stories.

Next, statements from respondents that provide explanation to the factors affecting their TPACK level are identified. In this step, words and phrases were identified, without taking those that were repeated in the same context. For example, "results" was mentioned twice by the same respondent, but it was only highlighted once in this step as it was repeating the same information.

> If there is a community that updates regularly, like on Reddit, I learn all the new tricks that I can use in class to help kids learn. I am someone who believes in results the best. I see results posted by the teachers online and I feel like this is a safe bet and I won't be wasting my effort if it can help them perform for sure. I guess I like it more if I have seen success stories.

Next, initial codes were generated by systematically coding interesting features from the responses. In the third step, these codes were collated into potential themes. The fourth step then involved reviewing the themes to ensure they worked in relation to the coded statements and the entire dataset, refining them as necessary. The fifth step was defining and naming the themes. For example, the statements "help kids learn" and "help them perform" are coded under curriculum needs, under the theme of student factors.

Table 3.5: Example of Coding Statements into Themes

Statement	Codes	Theme
help kids learn help them perform	curriculum needs	student factors
Reddit	learning platform	learning autonomy
community updates regularly teachers online new tricks	resource availability	professional support
safe bet success stories result	proven success positive experience	proven success

Finally, in the sixth step, the themes were interpreted and discussed, relating the analysis to the research question and literature. This step was guided by the six principles of Adult

Learning Theory by Knowles (1978), which are adult learners' need to know, self-concept, experience, readiness to learn, orientation of learning, and motivation to learn.

3.7 Ethical Considerations

To ensure the ethical practices of this study, informed consent was obtained from all participants, and measures were taken to protect participant anonymity and confidentiality and minimise the risk of harm or distress (Bryman, 2016). No real names were used in the presentation of data and pseudonyms were used at random without purposely matching the gender of the participants to the pseudonyms. Furthermore, participants were informed about the study purpose, objectives and the data collection methods used. Participants were also informed of how the data would be presented and any information that they wished to not disclose was respected. All the interview participants had requested that their voices and the schools they work at, not be shared with any parties other than the interviewer. Creswell (2012) states that, when anonymity is guaranteed, participants are more likely to provide honest and reliable responses, free from any social desirability bias or fear of negative repercussions, enhancing the credibility and reliability of the data collected. All participants were also aware of their right to withdraw from the study at any time they wished to. This was stated in the questionnaire and explained again verbally before the interview sessions were conducted. The interview participants were also informed that they could withdraw consent for the information provided even after the interview session had ended. The ethical considerations highlighted were practised in the present study to maintain the integrity and credibility of the research and to protect the welfare of participants (Creswell & Clark 2017).

3.8 Limitations of the Study

One primary limitation is the subjectivity of the scale, which can lead to response biases. Social desirability bias, for instance, might occur when participants felt like they need to provide socially desirable answers rather than their true opinions (Furnham, 1986). This could potentially undermine the validity of the data, as it does not accurately represent the participants' views. Additionally, central tendency bias might arise when participants avoid extreme responses, leading to a misrepresentation of their opinions (Weijters et al. 2010). Moreover, participants might not take the survey seriously, provide incomplete answers, or rush through the questions, which could compromise the validity of the data collected (Creswell, 2014).

Another limitation of the research is the fact that data was gathered solely from volunteers, which could introduce self-selection bias. This occurs when individuals decide whether or not to partake in a study, potentially yielding a sample that is not representative of the intended population (Heckman, 1979). Participants who self-select might have specific traits, attitudes, or actions that set them apart from those who opted out. Consequently, the sample may not adequately reflect the target population's diversity and complexity. For instance, teachers who consider themselves lacking in TPACK knowledge may avoid participating, while those who do participate might be actively incorporating technology into their teaching and feel comfortable sharing their thoughts and opinions in the study.

To minimise the effects of the aforementioned limitations on the data of the study, several strategies were employed to enhance the quality and validity of the self-report data. First, participants were informed of the anonymity and confidentiality of their responses, so they felt comfortable providing honest answers without fear of repercussions. This was communicated to the respondents both in written and oral form at the beginning of the questionnaire, and the interview. Moreover, sufficient response time was also provided to complete the questionnaire, taking into consideration the length and complexity of the questions. Response rate tracking and follow-up with the Head of the English Language Panel in each school were implemented to remind participants and minimise the number of non-participants in the four districts. By employing these strategies, the present study hoped to mitigate the potential impact of the limitations associated with self-report data and improve the overall quality and validity of this study's findings.

In conclusion, the methodology outlined was employed to investigate English language teachers' readiness to integrate technology into their lessons, with a specific focus on Technological Pedagogical Content Knowledge (TPACK).. The study adopted a mixed-methods research design to investigate English Language teachers' TPACK level and identify factors determining their readiness to integrate technology into lessons. The study sampled participants to ensure they met criteria concerning their teaching context, training, and curriculum implementation, and later in the qualitative phase the reported TPACK level, aiming to produce dependable, generalisable, and context-specific insights. The study ensured ethical practices by obtaining informed consent, protecting anonymity, minimising harm, and guaranteeing the right to withdraw, enhancing data credibility and reliability. Moreover, adapted instruments were used to ensure the data collected are relevant to the context of the Malaysian English language classroom, and mitigating strategies were applied to minimise the possible effect of the limitations that the present study.

As discussed, the study may have limitations due to subjective scales, response biases, and self-selection bias as participation is voluntary. To address these limitations, the study employed strategies such as providing anonymity and confidentiality to eliminate fear of repercussions, allowing sufficient response time, and implementing response rate tracking and follow-up to minimise the number of non-participants. Although the limitations cannot be eliminated, these strategies that were carried out aimed at improving the quality and validity of the study findings.

CHAPTER 4

FINDINGS

4.1 Introduction

This chapter will present the analysis of the findings of both the quantitative and qualitative data gathered. Section 4.2 presents the teachers' TPACK level, and Section 4.3 the factors determining teachers' TPACK.

4.2 Teachers' TPACK level

The teachers' level of readiness in terms of Technological Pedagogical Content Knowledge was examined and represented in eight matrices (Table 4.1 to Table 4.8). The teachers' knowledge levels for all seven domains of TK, PK, CK, TPK, TCK, PCK, and TPCK are shown separately to better present the teachers' responses for each item under each knowledge domain. The findings in these matrices are presented with the mean, standard deviation, Cronbach alpha, and level of knowledge domain interpreted from the mean score. The responses were also examined under demographic variables of teachers' age, gender, and teaching experience and shown in six matrices (Table 4.9 to Table 4.14). The findings in these matrices are presented with the mean of each knowledge domain according to demographic variables.

The levels of the mean range are: Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = (*M=2.60-3.39*), High (*M=3.40-4.19*), and Very High (*M=4.20-5.00*). The lower limit and upper limit of each interval class were decided from the five-point Likert scoring system whereby one was the lowest score and five the highest. The decision to have a uniform difference in every interval was based on Pimentel (2010) who stated a uniform interval difference would ensure no bias in the weighted mean. Table 4.1 shows the mean score, standard deviation, and Cronbach's alpha for the seven knowledge domains of teachers' TPACK.

Table 4.1: Technological Pedagogical Content Knowledge of Teachers (N = 201)

Domains of TPACK	Mean	SD	α	Level
Technological Knowledge	3.97	0.99	0.95	High
Pedagogical Knowledge	4.16	0.65	0.90	High
Content Knowledge	4.65	0.52	0.94	Very high
Technological Pedagogical Knowledge	3.90	0.93	0.95	High
Technological Content Knowledge	4.04	0.97	0.92	High
Pedagogical Content Knowledge	4.37	0.59	0.91	Very High
Technological Pedagogical Content Knowledge	3.99	0.98	0.93	High

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39*), High *(M=3.40-4.19*), Very High *(M=4.20-5.00*)

Results showed high TK, PK, TPK, TCK, and TPCK domains, and very high CK and PCK domains among teachers. The TPACK knowledge domain that scored the highest mean score was CK (M= 4.65, SD = 0.52, α = 0.94). This was followed by PCK (M= 4.37, SD = 0.59, α = 0.91), PK (M= 4.16, SD = 0.65, α = 0.90), TCK (M= 4.04, SD = 0.97, α = 0.92), TPCK (M= 3.99, SD = 0.98, α = 0.93), TK (M= 3.97, SD = 0.99, α = 0.95), and TPK (M= 3.90, SD = 0.93, α = 0.95). The internal consistency scores for each of the seven knowledge domains were calculated through Cronbach's alpha: TK (α = 0.95), PK (α = 0.90), CK (α = 0.94), TPK (α = 0.95), TCK (α = 0.92), PCK (α = 0.91), and TPCK (α = 0.93). This indicated high internal reliability of the items (DeVellis, 2003) in the questionnaire for measuring the respondents' TPACK. Notably, all four technological-based knowledge domains, which are the TCK, TPCK, TK, and TPK domains, reported lower mean scores compared to non-technological-based knowledge domains of CK, PK, and PCK, indicating that respondents rated themselves as weaker in technological knowledge. Another notable finding was that teachers scored very high for content-related knowledge domains which are not related to technological knowledge.

4.2.1 Technological Knowledge (TK) Domain

Table 4.2 shows the mean scores and standard deviations for the nine items in the TK domain of the questionnaire.

Table 4.2: Technological Knowledge of Teachers (N = 201)

Technological Knowledge Domain	Mean	SD	α	Level
Items	**3.97**	**0.99**	**0.95**	**High**
I can use basic technological terms (e.g. operating system, wireless connection, virtual memory) appropriately.	4.19	0.85		
I can adjust computer settings (e.g. installing software, establishing an Internet connection).	4.00	1.01		
I can use computer peripherals (e.g. scanner, recording devices)	4.25	0.86		
I can troubleshoot common computer problems (e.g. connection problems) independently.	3.56	1.19		
I can use digital classroom equipment (e.g. projectors, smartboards).	4.14	0.91		
I can use Office programs (e.g. Word, PowerPoint, Excel) with a high level of proficiency.	3.94	0.98		
I can create multimedia (e.g. video, web pages) using text, pictures, sound, video, and animation.	3.59	1.28		
I can use collaboration tools (e.g. Padlet, Google Classroom, Wikispaces) in accordance with my objectives.	4.02	0.92		
I can learn software that helps me complete a variety of tasks more efficiently.	4.08	0.96		

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=* .20 - 5.00)

Under the TK domain, only one item "I can use computer peripherals" reported a very high level of agreement (M=4.25). This was followed by "I can use basic technological terms appropriately" (M=4.19), "I can use digital classroom equipment" (M=4.14), "I can learn software that helps me complete a variety of tasks more efficiently" (M=4.08), "I can adjust computer settings" (M=4.00), "I can use collaboration tools in accordance with my objectives" (M=4.02), "I can use Office programs with a high level of proficiency" (M=3.94), "I can create multimedia using text, pictures, sound, video, and animation" (M=3.59), and "I can troubleshoot common computer problems independently" (M=3.56) which reported a high level of agreement. Findings suggest that teachers are well-versed in technological knowledge and may be less knowledgeable in troubleshooting technological tools. The findings indicate that teachers have a high level of readiness for technology integration in terms of technological knowledge.

A detailed analysis of the individual items reveals variability in specific areas of expertise. The highest mean score (M=4.25) is observed in the ability to use computer peripherals, such as scanners and recording devices, indicating that teachers are particularly confident in handling external hardware. Similarly, high proficiency is reported in the use of basic technological terms (M=4.19) and digital classroom equipment like projectors and smartboards (M=4.14). These scores likely reflect the regular use and familiarity of these tools in daily teaching activities, leading to greater confidence and expertise.

Conversely, the ability to troubleshoot common computer problems independently has the lowest mean score (M=3.56). A plausible hypothesis is that teachers may rely more on IT support for technical issues, resulting in less confidence in their troubleshooting skills. Additionally, the ability to create multimedia content (M=3.59) scored lower, which could be due to the complexity and time investment required to master these skills, as well as potentially limited exposure or training in multimedia production.

The proficiency in using Office programmes (M=3.94) and collaboration tools (M=4.02) is solid but not exceptional. This might be attributed to these tools being seen as essential but not particularly challenging, leading to functional rather than expert-level use.

Overall, these scores suggest that while teachers have a strong foundation in basic technological knowledge, there may be less emphasis on developing advanced skills like troubleshooting and multimedia creation. This could stem from a combination of reliance on support systems, varying levels of training and exposure, and the perceived necessity of certain skills in their specific teaching contexts. Targeted professional development could address these gaps and enhance overall technological competence.

4.2.2 Pedagogical Knowledge (PK) Domain

Table 4.3 the mean scores and standard deviations for the six items in the PK domain of the questionnaire.

Table 4.3: Pedagogical Knowledge of Teachers (N = 201)

Pedagogical Knowledge Domain	Mean	SD	α	Level
Items	**4.16**	**0.65**	**0.90**	**High**
I can use teaching methods and techniques that are appropriate for a learning environment.	4.33	0.58		
I can design a learning experience that is appropriate for the level of students.	4.18	0.60		
I can support students' learning in accordance with their physical, mental, emotional, social, and cultural differences.	4.05	0.64		
I can collaborate with school stakeholders to support students' learning.	4.12	0.68		
I can reflect on the experiences that I gained from professional development programs in my teaching process.	4.29	0.64		
I can support students' out-of-class work to facilitate their self-regulated learning.	3.98	0.78		

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=4.20-5.00)*

Under the PK domain, two items reported a very high level of agreement. They are "I can use teaching methods and techniques that are appropriate for a learning environment" (M= 4.33), and "I can design a learning experience that is appropriate for the level of students" (M= 4.18). This was followed by four items that reported teachers' high level of agreement. They are "I can support students' learning in accordance with their physical, mental, emotional, social, and cultural differences" (M=4.05), "I can collaborate with school stakeholders to support students' learning" (M=4.12), "I can reflect the experiences that I gain from professional development programs to my teaching process" (M=4.29), and "I can support students' out-of-class work to facilitate their self-regulated learning" (M=3.98). Findings suggest that teachers are confident with their pedagogical knowledge and are only comparatively less confident when it comes to their ability to assist students' independent learning outside the classroom context. This indicates that teachers have a high level of readiness for technology integration in terms of pedagogical knowledge.

4.2.3 Content Knowledge (CK) Domain

Table 4.4 shows the mean scores and standard deviations for the four items in the CK domain of the questionnaire.

Table 4.4: Content Knowledge of Teachers (N = 201)

Content Knowledge Domain	Mean	SD	α	Level
Items	**4.65**	**0.52**	**0.94**	**Very high**
I can express my ideas and feelings by speaking in English	4.62	0.54		
I can express my ideas and feelings by writing in English.	4.58	0.57		
I can understand texts written in English.	4.71	0.48		
I can understand what I listen to in English	4.71	0.48		

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39*), High *(M=3.40-4.19*), Very High *(M=4.20-5.00*)

Under the CK domain, all four items "I can understand texts written in English" (M=4.71), "I can understand what I listen to in English" (M=4.71), "I can express my ideas and feelings by speaking in English" (M=4.62), and "I can express my ideas and feelings by writing in English" (M=4.58), reported a very high level of agreement. Findings suggest that teachers have a very high level of readiness for technology integration in terms of English language content knowledge.

The highest mean scores (M=4.71) are observed in the ability to understand both written texts and spoken English. This likely indicates that teachers have strong receptive skills, which are essential for comprehending teaching materials, engaging with students, and staying updated with educational resources. These skills are foundational to effective teaching, particularly in contexts where English is the medium of instruction.

Slightly lower, though still high, mean scores are seen in the ability to express ideas and feelings by speaking (M=4.62) and writing (M=4.58) in English. A plausible hypothesis is that while teachers are highly proficient, they might find productive skills, speaking and writing, a bit more challenging due to the active effort required to formulate and articulate thoughts in English. This could also reflect varying levels of confidence in using English creatively or in less structured situations, compared to the more straightforward task of understanding written and spoken language.

Overall, these scores suggest a strong command of English language skills among teachers, particularly in comprehension. However, the slightly lower scores in speaking and writing might indicate areas where further practice or professional development could enhance teachers' confidence and proficiency, particularly in expressing themselves clearly and effectively in diverse classroom situations.

4.2.4 Technological Pedagogical Knowledge (TPK) Domain

Table 4.5: Technological Pedagogical Knowledge of Teachers (N = 201)

Technological Pedagogical Knowledge Domain	Mean	SD	α	Level
Items	**3.90**	**0.93**	**0.95**	**High**
I can meet students' individualised needs by using information technologies.	3.75	0.95		
I can lead students to use information technologies legally, ethically, safely, and with respect to copyrights.	3.82	0.99		
I can support students as they use technology (e.g. virtual discussion platforms) to develop their higher order thinking abilities.	3.82	0.96		
I can manage the classroom learning environment while using technology in the class.	4.03	0.87		
I can decide when technology would benefit my teaching of specific English curricular standards.	4.10	0.79		
I can design learning materials by using technology (e.g. mobile applications) that supports students' language learning.	3.70	1.03		
I can use multimedia (e.g. videos, websites) to support students' language learning.	4.06	0.91		

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=4.20-5.00)*

Table 4.5 the mean scores and standard deviations for the seven items in the TPK domain of the questionnaire.

Under the TPK domain, all seven items reported a high level of agreement. The item "I can decide when technology would benefit my teaching of specific English curricular standards" (M=4.10) reported the highest mean score, followed by "I can use multimedia to support students’ language learning” (M=4.06), “I can manage the classroom learning environment while using technology in the class” (M=4.03), “I can lead students to use information technologies legally, ethically, safely, and with respect to copyrights” (M=3.82), “I can support students as they use technology to develop their higher-order thinking abilities” (M=3.82), “I can meet students’ individualised needs by using information technologies” (M=3.75), and “I can design learning materials by using technology that supports students’ language learning” (M=3.70). Findings suggest that teachers have a high level of readiness for technology integration in terms of technological pedagogical knowledge.

The highest mean scores are observed in teachers' ability to decide when technology would benefit their teaching of specific English curricular standards (M=4.10) and their ability to manage the classroom learning environment while using technology (M=4.03). These scores suggest that teachers are comfortable with making informed decisions about when and how to incorporate technology into their lessons, as well as maintaining control over the learning environment when doing so. This indicates a solid foundational understanding of the pedagogical use of technology.

However, lower scores are seen in areas such as designing learning materials using technology (M=3.70) and meeting students’ individualised needs through information technologies (M=3.75). A possible hypothesis is that creating tailored, technology-based resources may require more advanced skills or time investment, which teachers may find challenging given their other responsibilities. Similarly, addressing individualised needs with technology might be more difficult due to the complexity of differentiating instruction in a digital format.

The scores related to supporting students in using technology ethically and in developing higher-order thinking abilities (M= 3.82) reflect a reasonable proficiency, though the need for further enhancement is apparent. This might be due to the growing emphasis on digital literacy and critical thinking in education, where teachers may require additional training to fully support these areas.

Overall, these scores suggest that while teachers are generally adept at integrating technology into their pedagogy, there are specific areas, such as designing digital materials and addressing individual needs, where targeted professional development could further enhance their effectiveness.

4.2.5 Technological Content Knowledge (TCK) Domain

Table 4.6 the mean scores and standard deviations for the three items in the TCK domain of the questionnaire.

Table 4.6: Technological Content Knowledge of Teachers (N = 201)

Technological Content Knowledge Domain	Mean	SD	α	Level
Items	**4.04**	**0.97**	**0.92**	**High**
I can take advantage of multimedia (e.g. video, slideshow) to express my ideas about various topics in English.	4.05	0.99		
I can use collaboration tools (e.g. Padlet, Google Classroom, Wikispaces) to work collaboratively with others in English.	4.04	0.97		
I can benefit from using technology (e.g. web conferencing, discussion forums) to contribute to communities in English.	4.03	0.94		

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=4.20-5.00)*

All three items under the TCK domain "I can take advantage of multimedia to express my ideas about various topics in English" (M=4.05), "I can use collaboration tools to work collaboratively with others in English" (M=4.04), and "I can benefit from using technology to contribute to communities in English" (M=4.03) reported a high level of agreement. This suggests that teachers have a high level of readiness for technology integration in terms of technological content knowledge.

The highest mean score (M=4.05) is observed in the ability to take advantage of multimedia, such as videos and slideshows, to express ideas about various topics in

English. This reflects teachers' confidence in using visual and auditory tools to reinforce their teaching, making content more engaging and accessible to students. The slightly higher score in this area may be attributed to the widespread availability and familiarity of multimedia tools, which are often easier to integrate into lessons.

Similarly, the ability to use collaboration tools like Padlet, Google Classroom, and Wikispaces to work collaboratively with others in English scored a mean of 4.04. This suggests that teachers are comfortable using digital platforms to foster communication and teamwork, essential skills in a modern educational environment. The ease of access and user-friendly nature of these tools likely contribute to the high level of confidence reported.

The slightly lower, though still strong, mean score (M=4.03) in benefiting from technology such as web conferencing and discussion forums to contribute to communities in English indicates that while teachers are proficient, there may be some challenges in effectively engaging with broader communities. This could stem from less frequent use of these tools compared to more classroom-focused technologies, or a need for further training to fully leverage these platforms.

Overall, these scores suggest that teachers are adept at using technology to enhance their content delivery and communication in English. However, ongoing professional development focused on more advanced or community-oriented technologies could further strengthen their Technological Content Knowledge and broaden their impact both inside and outside the classroom.

4.2.6 Pedagogical Content Knowledge (PCK) Domain

Table 4.7 shows the mean scores and standard deviations for the five items in the PCK domain of the questionnaire.

Table 4.7: Pedagogical Content Knowledge of Teachers (N = 201)

Pedagogical Content Knowledge Domain	Mean	SD	α	Level
Items	**4.37**	**0.59**	**0.91**	**Very High**
I can manage a classroom learning environment.	4.39	0.57		
I can evaluate students' learning processes.	4.52	0.56		
I can use appropriate teaching methods and techniques to support students in developing their language skills.	4.32	0.58		
I can prepare curricular activities that develop students' language skills.	4.30	0.62		
I can adapt a lesson plan in accordance with students' language skill levels.	4.32	0.60		

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=4.20-5.00)*

For the PCK domain, teachers responded with a very high level of agreement for all five items of "I can evaluate students' learning processes" (M=4.52), "I can manage a classroom learning environment" (M=4.39), "I can use appropriate teaching methods and techniques to support students in developing their language skills" (M=4.32), "I can adapt a lesson plan in accordance with students' language skill levels" (M=4.32), and "I can prepare curricular activities that develop students' language skills" (M=4.30). This suggests that teachers have a very high level of readiness for technology integration in terms of pedagogical content knowledge.

The highest mean score (M=4.52) is observed in the ability to evaluate students' learning processes. This reflects a strong competence among teachers in assessing how well students are absorbing and applying language skills, which is fundamental to tailoring instruction and ensuring effective learning outcomes. The emphasis on evaluation suggests that teachers are adept at using assessment as a tool to inform their teaching practices and adapt their strategies to meet students' needs. Managing the classroom learning environment also scored highly (M=4.39), indicating that teachers feel confident in creating and maintaining an organised and productive atmosphere conducive to learning. This is crucial for the effective delivery of curriculum content and ensuring that students remain engaged and focused during lessons. Slightly lower, but still strong, mean scores are seen in using appropriate teaching methods and techniques (M=4.32), preparing curricular activities (M=4.30), and adapting lesson plans according to students' language skill levels (M=4.32). These scores suggest that while teachers are proficient in these areas, there may be slight challenges in consistently aligning instructional strategies with the varying skill levels of students. This could be due to the complexity of differentiation in diverse classrooms or the need for more resources and time to develop tailored activities.

Overall, these scores indicate that teachers possess strong Pedagogical Content Knowledge, with particular strengths in evaluation and classroom management. However, continued professional development focused on refining instructional strategies and lesson adaptation could further enhance their ability to support diverse student needs effectively.

4.2.7 Technological Pedagogical Content Knowledge (TPCK) Domain

Table 4.8: Technological Pedagogical Content Knowledge of Teachers (N = 201)

Technological Pedagogical Content Knowledge Domain	Mean	SD	α	Level
Items	**3.99**	**0.98**	**0.93**	**High**
I can use collaboration tools (e.g. Zoom, Google Drive, Padlet) to support students' language learning.	4.09	0.89		
I can support students as they use technology to support their development of language skills in an independent manner.	3.98	0.98		
I can use Web 2.0 tools (Instagram, WordPress, Wikis, YouTube) to develop students' language skills.	3.86	1.09		
I can support my professional development by using technological tools and resources to continuously improve the language teaching process.	4.01	0.96		

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=4.20-5.00)*

Table 4.8 shows the mean scores and standard deviations for the four items in the TPCK domain of the questionnaire. Under the TPCK domain, a high level of agreement was reported for the four items "I can use collaboration tools to support students' language learning" (M=4.09), "I can support my professional development by using technological tools and resources to continuously improve the language teaching process" (M=4.01), "I can support students as they use technology to support their development of language skills in an independent manner" (M=3.98), and "I can use Web 2.0 tools to develop students' language skills" (M=3.86) was reported. This suggests that teachers have a high level of readiness for technology integration in terms of technological pedagogical content knowledge.

The highest mean score (M=4.09) is observed in the use of collaboration tools such as Zoom, Google Drive, and Padlet to support students' language learning. This suggests that teachers are confident in leveraging these tools to facilitate collaborative learning environments, which are increasingly important in both remote and in-person educational settings. The familiarity and widespread use of these platforms likely contribute to the higher confidence levels reported by teachers.

Supporting professional development through technological tools and resources also scored well (M=4.01). This indicates that teachers recognise the importance of continuous improvement in their teaching practices and are actively using technology to enhance their professional growth. The strong score in this area reflects a commitment to lifelong learning and adapting to new teaching methodologies.

However, slightly lower mean scores are seen in supporting students as they use technology independently to develop language skills (M=3.98) and in using Web 2.0 tools to develop students' language skills (M=3.86). These lower scores may suggest that while teachers are proficient in using more traditional or well-established tools, they might find it more challenging to integrate newer or more social-media-oriented platforms into their teaching. This could be due to a lack of familiarity, training, or confidence in using these tools effectively within an educational context.

Overall, the scores indicate that teachers are reasonably adept at integrating technology into their pedagogical practices, particularly in collaborative and professional development contexts. However, targeted professional development focusing on the effective use of Web 2.0 tools and fostering student independence in technology use could further strengthen their Technological Pedagogical Content Knowledge and enhance their ability to support diverse learning needs.

4.2.8 Teachers' TPACK According to Demographic Variables

An analysis was also done to investigate if the teachers' TPACK level differs according to the demographic variables of teachers' age, gender, and professional experience for all seven knowledge domains of TK, PK, CK, TPK, TCK, PCK, and TPCK.

4.2.8.1 Teachers' Age

Table 4.9: Teachers' Technological Pedagogical Content Knowledge According to Age Groups (N = 201)

Age Group (years)	N	SD	TK	PK	CK	TPK	TCK	PCK	TPCK	Overall Mean
25 and below	38 (18.91%)	0.96	4.01	4.11	4.56	3.86	3.96	4.33	3.99	3.71
26 to 35	54 (26.87%)	0.87	4.09	4.16	4.75	3.98	4.14	4.39	4.05	3.80
36 to 45	51 (10.45%)	0.85	4.03	4.22	4.71	3.97	4.10	4.43	4.11	3.80
46 to 55	39 (19.40%)	0.61	3.82	4.12	4.64	3.81	4.07	4.35	3.85	3.66
56 and above	19 (9.45%)	0.99	3.74	4.16	4.43	3.73	3.74	4.27	3.74	3.60

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=4.20-5.00)*

An analysis of teachers' TPACK according to the five age groups of twenty five and, twenty six to thirty five, thirty six to forty five, forty six to fifty five, and fifty six and above was done (Table 4.9).

Teachers aged twenty five and below, which stands for 18.91% of the sample (N = 38), exhibited high scores in TK (M=4.01), PK (M=4.11), TCK (M=3.86), TPK (M=3.96), TPCK (M=3.99), CK (M=4.56), and PCK (M=4.33). Teachers in the age group of twenty six to thirty five, making up 26.87% of participants (N = 54), reported high scores in TK

(M=4.09), PK (M=4.16), TCK (M=3.98), TPK (M=4.14), TPCK (M=4.05), CK (M=4.75), and PCK (M=4.39). Teachers aged thirty six to forty five, accounting for 10.45% of the sample (N = 51), showcased high scores in TK (M=4.03), PK (M=4.22), TCK (M=3.97), TPK (M=4.10), TPCK (M=4.11), and very high scores in CK (M=4.71) and PCK (M=4.43). Teachers in the age group of forty six to fifty five, comprising 19.40% of participants (N = 39), reported high scores across all domains: TK (M=3.82), PK (M=4.12), TCK (M=3.81), TPK (M=4.07), TPCK (M=3.85), CK (M=4.64), and PCK (M=4.35). Lastly, teachers aged fifty six and above, making up 9.45% of respondents (N=19), has high scores in TK (M=3.74), PK (M=4.16), TCK (M=3.73), TPK (M=3.74), TPCK (M=3.74), and very high scores in CK (M=4.43) and PCK (M=4.27).

A one-way analysis of variance was conducted to assess differences across multiple knowledge domains (Table 4.10).

Table 4.10: One-Way ANOVA of Results for Teachers' TPACK Scores in Terms of Age

		Sum of Squares	df	Mean Square	F	p	η^2
TK	Between Groups	2.990	4	.748	1.021	.397	0.021
	Within Groups	143.430	196	.732			
	Total	146.420	200				
CK	Between Groups	1.950	4	.487	2.227	.068	0.068
	Within Groups	42.908	196	.219			
	Total	44.858	200				
PK	Between Groups	.357	4	.089	.307	.873	0.006
	Within Groups	56.907	196	.290			
	Total	57.264	200				
PCK	Between Groups	.469	4	.117	.459	.766	0.009
	Within Groups	50.123	196	.256			
	Total	50.593	200				

Table 4.10 continued

TCK	Between Groups	2.712	4	.678	.839	.502	0.017
	Within Groups	158.387	196	.808			
	Total	161.099	200				
TPK	Between Groups	1.594	4	.399	.580	.678	0.011
	Within Groups	134.790	196	.688			
	Total	136.384	200				
TCPK	Between Groups	2.991	4	.748	.929	.448	0.019
	Within Groups	157.784	196	.805			
	Total	160.775	200				

For Technological Knowledge (TK), no statistically significant difference was observed between the groups, η^2=.021. Similarly, for Content Knowledge (CK), the results were not statistically significant, η^2=.043. Pedagogical Knowledge (PK) also showed no significant difference, η^2=.006. This pattern continued for Pedagogical Content Knowledge (PCK) η^2=.009, Technological Content Knowledge (TCK) η^2=.017, Technological Pedagogical Knowledge (TPK) η^2=.011, and lastly, Technological Pedagogical Content Knowledge (TPCK) η^2=.019. Across all domains, the groups' variance was consistently not significant of the total variance in each domain's scores.

In a holistic view across all age groups, the two knowledge domains of Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) are frequently reported as the highest-scoring domains. To be specific, teachers aged twenty five and below held a high overall mean score (M=3.71). Teachers in both the age groups of twenty six to thirty five, and thirty six to forty five reported a high overall mean score (M=3.80). The age group forty six to fifty five presented a high overall mean score of 3.66, and the senior group, fifty six and above, noted a high mean score of 3.60. To summarise the findings, across different age groups, there's an evident high readiness in terms of technological pedagogical content knowledge, with CK and PCK consistently outperforming.

The variation in mean scores across different age groups in various knowledge domains could be attributed to the unique experiences and challenges faced by each group. However, it is important to note that there are no significant differences between the age groups for overall TPACK, as it considers a combination of all knowledge domains. What one age group may lack in a particular domain is often compensated by strengths in another.

For example, the youngest group of teachers, those aged twenty five and below, may score lower in pedagogical-related domains due to their relatively limited classroom experience. However, they tend to score highest in technological-related domains, likely because their recent education included more emphasis on integrating technology into teaching, and they are generally more comfortable with digital tools.

In contrast, teachers in the twenty six to forty five age group perform well across many domains, likely due to a balance of accumulated teaching experience and adaptability. Their solid scores in Pedagogical Knowledge (PK) and Content Knowledge (CK) reflect their experience, while their relatively high scores in technological domains indicate they are still flexible and open to incorporating new technologies.

Older teachers, particularly those aged forty six and above, may score slightly lower in technological domains, possibly due to the challenges of adapting to new technologies later in their careers. However, they compensate for this with strong foundations in traditional pedagogical methods, reflected in their higher scores in PK and CK.

4.2.8.2 Teachers' Gender

Teachers' TPACK according to gender was analysed for all seven knowledge domains (Table 4.11).

Table 4.11: Teachers' Technological Pedagogical Content Knowledge According to Gender (N = 201)

Gender	N	TK	CK	PK	PCK	TCK	TPK	TPCK
Female	152 (75.62%)	3.93	4.63	4.13	4.36	4.03	3.86	3.97
Male	49 (24.38%)	4.11	4.71	4.24	4.40	4.07	4.01	4.03

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39*), High *(M=3.40-4.19*), Very High *(M=4.20-5.00*)

Female teachers reported high TK (M=3.93), PK (M=4.13), TCK (M=4.03), TPK (M=3.86), and TPCK (M=3.97), and very high CK (M=4.63) and PCK (M=4.36). Male teachers reported high PK (M=4.24), PCK (M=4.40), TCK (M=4.07), TPK (M=4.01), and TPCK (M=4.03), and very high TK (M=4.11) and CK (M=4.71). Both female and male teachers reported the same level for the knowledge domains of CK, PCK, TCK, TPK, and TPCK. The knowledge domains that showed a difference in levels reported with male teachers scoring a higher mean in both are the TK and PK domains. To summarise, results indicated that female teachers have a high level of readiness in terms of technological pedagogical content knowledge, and male teachers also exhibit a high to very high level of readiness in terms of technological pedagogical content knowledge.

A one-way analysis of variance was conducted to assess differences across multiple knowledge domains (Table 4.12).

Table 4.12: One-Way ANOVA of Results for Teachers' TPACK Scores in Terms of Gender

		Sum of Squares	df	Mean Square	F	p	η^2
TK	Between Groups	1.300	1	1.300	1.782	.183	0.0089
	Within Groups	145.120	199	.729			
	Total	146.420	200				
CK	Between Groups	.205	1	.205	.912	.341	0.0046
	Within Groups	44.654	199	.224			
	Total	44.858	200				
PK	Between Groups	.485	1	.485	1.700	.194	0.0085
	Within Groups	56.779	199	.285			
	Total	57.264	200				
PCK	Between Groups	.070	1	.070	.277	.599	0.0014
	Within Groups	50.522	199	.254			
	Total	50.593	200				
TCK	Between Groups	.046	1	.046	.057	.812	0.0003
	Within Groups	161.053	199	.809			
	Total	161.099	200				
TPK	Between Groups	.842	1	.842	1.236	.267	0.0062
	Within Groups	135.542	199	.681			
	Total	136.384	200				
TPCK	Between Groups	.127	1	.127	.157	.692	0.0008
	Within Groups	160.648	199	.807			
	Total	160.775	200				

An analysis of variance was conducted across gender assessing differences in multiple knowledge domains. For Technological Knowledge (TK), there was no significant difference between genders, η^2=0.0089. It was also non-significant for Content Knowledge (CK), η^2=0.0046, Pedagogical Knowledge (PK), η^2=0.0085, Pedagogical Content Knowledge (PCK), η^2=0.0014, Technological Content Knowledge (TCK), η^2=0.0003, Technological Pedagogical Knowledge (TPK), η^2=0.0062, and Technological Pedagogical Content Knowledge (TPCK), η^2=0.0008. Across all domains, the variance between genders contributed only a small fraction of the total variance in scores for each domain.

The small effect sizes (η²) across all domains suggest that gender has little influence on teachers' proficiency. This likely indicates that regardless of gender, both male and female teachers have received similar training and preparation, having equal access to teacher education programmes and professional development opportunities.

To summarise, results indicated that both male and female teachers have a high level of readiness in terms of technological pedagogical content knowledge, and no statistical difference was observed for all groups.

4.2.8.3 Teachers' Professional Experience

An analysis of the demographic variable professional experience was also done to find out if there is a difference in the level of TPACK reported. The analysis was done for every knowledge domain according to five categories of experience in teaching the English language of one to five years, six to fifteen years, sixteen to twenty five years, twenty six to thirty five years, and thirty six years and more (Table 4.13).

Table 4.13: Teachers' Technological Pedagogical Content Knowledge According to Professional Experience (N = 201)

Years	N	TK	CK	PK	TPK	TCK	PCK	TPCK	Overall Mean
1 to 5	53 (26.37%)	4.07	4.59	4.07	3.94	4.06	4.30	4.08	4.16
6 to 15	64 (31.84%)	4.13	4.72	4.21	3.99	4.13	4.44	4.01	4.23
16 to 25	37 (18.41%)	3.78	4.76	4.21	3.86	4.03	4.39	3.98	4.14
26 to 35	36 (17.91%)	3.78	4.60	4.13	3.73	3.96	4.35	3.82	4.05
36 and above	11 (5.47%)	3.85	4.36	4.20	3.79	3.73	4.31	3.93	4.02

Note. Very Low *(M= 1.00-1.79)*, Low *(M= 1.80-2.59)*, Moderate = *(M=2.60-3.39)*, High *(M=3.40-4.19)*, Very High *(M=4.20-5.00)*

Teachers from the group with one to five years of experience teaching English reported very high TK (M=4.07), CK (M=4.59), PCK (M=4.30), and TPCK (M=4.08), and high PK (M=4.07), TPK (M=3.94), and TCK (M=4.06). The teachers with six to fifteen years of professional experience reported very high CK (M=4.72), PCK (M=4.44), and high TK

(M=4.13), PK (M=4.21), TPK (M=3.99), TCK (M=4.13), and TPCK (M=4.01). Teachers from the group with sixteen to twenty five years of experience teaching English reported very high CK (M=4.76) and PCK (M=4.39), and high TK (M=3.78), PK (M=4.21), TPK (M=3.86), TCK (M=4.03), and TPCK (M=3.98). Teachers with twenty six to thirty five years of professional experience reported very high CK (M=4.60) and PCK (M=4.35), and high TK (M=3.78), PK (M=4.13), TPK (M=3.73), TCK (M=3.96), and TPCK (M=3.82). The group of teachers with the most experience of thirty six years and above reported very high PCK (M=4.31), high CK (M=4.36), PK (M=4.20), TK (M=3.85), TPK (M=3.79), TCK (M=3.73), and TPCK (M=3.93).

A very high overall TPACK mean score was reported for teachers with professional experience teaching the English language for six to fifteen years (M=4.23). A high overall TPACK mean score was reported for teachers with experience of one to five years (M=4.16), sixteen to twenty five years (M=4.14), twenty six to thirty five years (M=4.05), and thirty six years and above (M=4.02). It was observed that there was not a strict linear decrease or increase in TPACK scores based on years of experience. The observed trends in TPACK scores did not show that the more years of teaching experience teachers have, the lower they score themselves on the technological-based domains.

A one-way analysis of variance was conducted to assess differences across multiple knowledge domains (Table 4.14).

Table 4.14: One-Way ANOVA of Results for Teachers' TPACK Scores in Terms of Teaching Experience

		Sum of Squares	df	Mean Square	F	Sig.	η^2
TK	Between Groups	5.040	4	1.260	1.747	.141	0.0344
	Within Groups	141.379	196	.721			
	Total	146.420	200				
CK	Between Groups	1.929	4	.482	2.201	.070	0.0430
	Within Groups	42.930	196	.219			
	Total	44.858	200				
PK	Between Groups	.704	4	.176	.610	.656	0.0123
	Within Groups	56.560	196	.289			
	Total	57.264	200				
PCK	Between Groups	.615	4	.154	.603	.661	0.0122
	Within Groups	49.978	196	.255			
	Total	50.593	200				
TCK	Between Groups	1.844	4	.461	.567	.687	0.0114
	Within Groups	159.255	196	.813			
	Total	161.099	200				
TPK	Between Groups	1.842	4	.461	.671	.613	0.0135
	Within Groups	134.542	196	.686			
	Total	136.384	200				
TPCK	Between Groups	1.593	4	.398	.490	.743	0.0099
	Within Groups	159.182	196	.812			
	Total	160.775	200				

An analysis of variance was conducted across different categories of teaching experience to discern differences in various knowledge domains. Across all domains, variations in teaching experience did not significantly contribute to the differences in knowledge scores. For Technological Knowledge (TK), there was no significant variance across teaching experience categories, η^2=0.0344. Similarly, no significant differences were observed across categories for Content Knowledge (CK), η^2=0.0430, Pedagogical Knowledge (PK), η^2=0.0123, Pedagogical Content Knowledge (PCK), η^2=0.0122, Technological Content Knowledge (TCK), η^2=0.0114, Technological Pedagogical

Knowledge (TPK), $\eta^2=0.0135$, and Technological Pedagogical Content Knowledge (TPCK), $\eta^2=0.0099$.

One possible reason for this uniformity could be the effective ongoing professional development and training that help keep teachers' skills up to date, regardless of their experience. Additionally, the necessity for teachers to rapidly adapt to technology during the COVID-19 lockdowns may have played a significant role in levelling the playing field. During this period, both novice and experienced teachers were compelled to embrace new technological tools and methods to continue delivering education remotely. This widespread and urgent adaptation likely contributed to a more uniform competence in technology integration across all levels of teaching experience, ensuring that teachers are equally prepared to integrate technology into their teaching.

To summarise, the study found that teachers reported a very high level of readiness in the domains of CK and PCK, and despite the comparatively lower mean score reported for all technological-based knowledge domains, respondents reported a high level of readiness in the domains of TPK, TCK, TPCK, and PK. The effects of demographic variables were non-significant in all the knowledge domains.

4.3 Factors Determining Teachers’ TPACK

A thematic analysis was done on the responses collected from the interview to investigate the factors determining English language teachers’ TPACK. All interview responses were transcribed for analysis. The data was read several times, and 203 statements were extracted and analysed. The selection of statements to be included in the analysis was done based on whether they explain what determines the teachers’ gaining of knowledge for technology integration under the TPACK. Coding was done by identifying meaningful chunks in the data. The study uses an inductive orientation of thematic analysis whereby coding and theme development are directed by the content of the data. Open coding was used whereby the study did not have a pre-decided set of codes but rather identified and modified throughout the coding process through the information obtained solely from the data (Maguire & Delahunt, 2017). During the coding process, the emergent themes were related to the principles of Adult Learning Theory. The theoretical framework helps to understand and explain findings better. Eighteen codes were identified, which were then categorised into six themes shown in Table 4.15. To better understand how the factors determining teachers' TPACK align with the principles of the Adult Learning Theory Table 4.15 also shows the mapping of the factors against the principles, and how they are connected. The factors identified are student factors, learning autonomy, professional support, institutional support, proven success, and curriculum.

Table 4.15: Factors Determining Teachers' TPACK for Technology Integration

Codes	Example of Statements	Theme	Principles of Adult Learning Theory	Connection
Curriculum needs Access Level and performance Interest Familiarity	new assessment format bring their laptops higher-level learners how much my students can do where their interest lies they are very good at it	Student	Need to Know	Understanding the role and needs of students drives teachers to recognise the importance of integrating technology, aligning with adults' intrinsic motivation to learn when they understand the reason or need.
Content Learning platform Pace	most relevant I am used to this and am most efficient this way adjust how much to learn	Learning Autonomy	Self-concept	By fostering learning autonomy in teachers, it empowers them as self-directed learners, mirroring adult learners' desire for autonomy in their learning.
Collegiality Resource availability	IT-buddy support session master trainers online community on Reddit.	Professional support	Learner's experience	Professional support acts as the foundational experience upon which teachers can relate their technological integration efforts, resembling how adult learners leverage their vast reservoir of experiences when learning.

Table 4.15 continued

Policy Funding Motivation	it is the government's policy higher score for my performance grading they funded tablets	Institutional support	Readiness to Learn	With the right institutional support, teachers become more ready and receptive to develop their TPACK, akin to how adults are ready to learn when they experience a need to cope with real-life situations.
Proven success Positive experience	going to work in class may not be realistic	Proven success	Orientation to Learning	Seeing the proven success of technological integration aligns with teachers' problem-solving orientation, reinforcing the idea that learning should be applicable and pragmatic.
Learning Objectives Instruction Evaluation	catalyst for task completion time-efficient or cost-effective	Curriculum	Motivation	A curriculum that supports technological integration acts as a significant intrinsic and extrinsic motivator, echoing the principle that adults are best motivated internally and by real benefits in their environment.

4.3.1 Student

Student factors were reported as the most prevalent theme for determiner of teachers' TPACK. Students' curriculum needs, access to tools in and out of class, level of their language skills and their performance, interest, and familiarity, were cited as the teachers' concerns when deciding what to learn for technology integration in their classroom instruction. These were the five codes identified and categorised under the theme of student factors. The practice of assessing students' needs enables teachers to develop and deliver lessons that are relevant to both the curriculum and language content and reflect what students want and are interested in the most (Lepetit & Cichocki, 2002). The responses gathered under the theme of student factor illustrated a situation whereby the context knowledge of the teaching environment is drawn to form insights into how teachers can best develop their TPACK. The student factor was identified in responses of teachers from all three levels of moderate, high, and very high TPACK.

Under the code of students' curriculum needs, respondents shared that they decide what technology to learn or master based on the tasks that students need to complete for a lesson. The decisions made to improve the technological knowledge were informed by the teacher's existing pedagogical content knowledge to decide what technologies are most advantageous for the specific curriculum needs of their students. Examples of responses are

> If you look at the new assessment format, there is a lot more that students can do to meet the learning objectives through online work. Some of the tasks are more authentic when the production is done through online platforms compared to the old way of handing in papers. (Ismail: High TPACK, M=4.08, 46 to 55 years old male, 6 to 15 years of teaching experience).

> I may not be the most tech-savvy, but I reflect on how these items helped me in my class. I think my benchmark for good is derived from how well the skills aided in my teaching in my classes. I also majored in IT in college but that is not the same as what you need to know to teach and manage your delivery. It doesn't have to be high-level skills like coding and network set-ups. What's important is learning what students need to experience in the new CEFR-aligned curriculum. (Farah: Very High TPACK, M=4.28, 36 to 45 years old female, 6 to 15 years of teaching experience).

For the code of students' access to tools in and out of class, respondents explained how students from different financial status backgrounds may have different access to technology tools or internet connections at home. It was further added that there is often limited access to functioning computer labs with good internet connections at school. These affected teachers' decisions to learn new technology tools or plan technology integration as the lessons might not be able to be carried out. When students are allowed to bring their devices to school, it motivated teachers to master the technology tools or plan lessons integrating technology. Examples of responses are

> It really makes a lot of difference when our Form five students are allowed to bring their laptops to school. I am more motivated to master more technology tools to use in class too. I wouldn’t want to be the person holding them back when the school had already provided them with a privilege like this. (Qaseh: Moderate TPACK, M=3.39, 46 to 55 years old female, 26 to 35 years of teaching experience).

> Troubleshooting the reconditioned and second-hand old computers normally takes a long time and it deters some teachers, especially those who are not so tech-savvy. (Chai: Very High TPACK, M=4.74, 46 to 55 years old female, 26 to 35 years of teaching experience).

> Our community of students are from families that are not very well-off so I consider these conditions when I include technology. If I think they will not have access to complete the task, I will not waste my time learning about a certain application, software, or website. (Xiao: Moderate TPACK, M=2.67, 56 years old and above male, 16 to 25 years of teaching experience).

For the code of students’ level and performance, respondents explained that the technology tools helped in assigning tasks for varying levels of students. This was cited as one of the teachers’ reasons for developing their TPACK. It was revealed that teachers would try to learn more or develop better skills compared to where students are at, to better monitor students’ learning progress and carry out assessments, especially for higher-level learners. This was shown in the responses of Siti who has a moderate level of TPACK and Diya with a very high level of TPACK. Examples of responses are

> When the students vary in interest and language skills level, it requires me to differentiate the task and materials. The best way is to assign a language production task to higher-level learners. Usually, this would be creating content or sharing information in the target language online. Whenever this happens, I would have to learn about the technology tool first beforehand so I

> can monitor the learning progress and assess the work done later. (Siti: Moderate TPACK, M=2.97, 26 to 35 years old female, 6 to 15 years of teaching experience).
>
> I think about how much my students can do and decide how much more I need to know. If my student is at a three out of ten, then I will need to be at least a six out of ten to be of help to them. (Diya: Very High TPACK, M=4.60, 36 to 45 years old female, 6 to 15 years of teaching experience).

For the code of students' interest, it was gathered that teachers decide what technology tools they learn, or further master to integrate into their lessons based on the students' acceptance, interest, and suggestions. Respondents expressed that they are open to suggestions from students, especially if it is something that they are very interested in. The input comes from students themselves in the form of suggestions and teachers' observations of what the students prefer. An example of a response is

> Students tell me what they hope I can include and suggest ways for me. For example, we were running a class wiki, and they taught me how to check their work on the wiki. It took a lot of effort and time to master that, and we don't always have time to use it, but they like it so I am happy with that small effort I put in at least. I do believe it is important to listen to what students want, or where their interest lies. (Wong: Moderate TPACK, M=2.80, 56 years old and above female, 26 to 35 years of teaching experience).

Under the code of students' familiarity, respondents revealed that they would prefer to learn if the students are already familiar with or know how to complete a task through a certain technology tool or platform. This is because it lessens the teaching burden when teachers only need to focus on the content and need not spend time on making sure that students know how to manoeuvre around a platform or technology tool. The students' familiarity is cited to be from other colleagues teaching the same group of students a different subject. An example of a response is

> I know my kids can use Glogster and do peer reviews easily there, so I made it a point to master Glogster. Their Physics teacher has been using that with them for over six months now so they are very good at it. (Gary: Very High TPACK, M=4.28, 46 to 55 years old male, 16 to 25 years of teaching experience).

4.3.2 Learning Autonomy

Learning autonomy was reported as another prevalent determining factor of teachers' TPACK. The codes identified for the theme of learners' autonomy were autonomy in deciding learning content, learning platform, and the pace of learning for technology integration. The teachers' responded in the interview by comparing their experiences of attending compulsory professional development courses to learning sessions that were done out of their own initiatives, both online and offline. Learning autonomy also was found to be the factors determining teachers' learning in all three groups of teachers with Moderate, High, and Very High TPACK.

Under the code of learning content, respondents stated that they prefer courses, workshops, or seminars which they had chosen to attend voluntarily. This is because teachers felt that they can decide what knowledge and skills would be most relevant to their teaching practices, expressing aversion towards compulsory technology courses organised by the school which they had to attend together with the entire teaching staff. The reason provided was that these courses are very rarely subject-specific and tend to focus too heavily on technological tools. Teachers also explained that with content that they have chosen themselves, especially through online streaming platforms, they have the choice of leaving the training course once they realise later that it does not meet their expectations. Teachers' preference in this aspect did not show a difference according to their level of technological-based knowledge. Respondents who scored high on technological-based knowledge in the questionnaire and those who scored low shared the same stand on their preference for the autonomy to choose the content of what they learn. An example of a response by a teacher with a high level of technological-based knowledge is

> I think the best learning is the one I looked up personally. There are many materials online that I've looked through especially when working from home. There are many seminars and workshops I chose. The best practice sharing on YouTube organised by English teachers in practice is the best and most relevant. There are many of them so I can look through the titles. It's on YouTube so even if something didn't turn out to be what I wanted to learn, I can just leave the workshop immediately. Sometimes they include the speakers as well and I check if they would be someone working in the field of something I wanted to learn. (Diya: Very High TPACK, M=4.60, TK=4.67, TCK=4.33, TPK=4.43, TPCK=4.25, 36 to 45 years old female, 6 to 15 years of teaching experience).

For respondents who are more senior in age and reported a very low, low, and moderate level of technological-based knowledge, teachers added that they would like their content to have simple instruction for beginner-level users of the technological tools. When given autonomy to select their own course content, respondents said they could go over the instructions repetitively, and they could look up unfamiliar terms used. Autonomy allows senior teachers to progress at their own pace according to their prior knowledge and skills. An example of a response is

> I don't need it to be very high-tech, complicated, or the most edge-cutting technology. I just need to find a technology tool that will fit my learning objectives for that lesson. (Xiao: Moderate TPACK, M=2.67, TK=4.67,

> TCK=4.33, TPK=4.43, TPCK=4.25, 56 years old and above male, 16 to 25 years of teaching experience).

Under the code of the platform of learning, teachers explained that their familiarity and prior experience with the method or platform of learning affect how much they learn. When they are used to the platforms or methods, it helps in learning as it enables them to complete or practice tasks required more efficiently. Other than evidence from the response by Diya, the response by Tiong is another sample of the response that helped illustrate this code.

> I still print out the instructions on paper and refer to the instructions and explanations every step along the way when I learn about new technology tools. I think this is the best for me because I am used to this and am most efficient this way. I don't have the schemata at my fingertips like the younger teachers so I can't just immediately know what I need to do, and where to do it. (Tiong: Moderate TPACK, M=3.18, 46 to 55 years old female, 26 to 35 years of teaching experience).

Under the code of learning pace, respondents expressed that they are most comfortable when they are learning at their own pace. This is true for both respondents who scored a very high TPACK level, and those who scored a moderate for their TPACK level. Respondents explained that knowledge for technology integration is very individual-specific and the amount of time needed to learn or revise that new knowledge may vary. Therefore, autonomy in deciding the learning pace was seen as a determiner of teachers' knowledge of technology integration. Teachers explained that when they are learning at their own pace, they set their own learning rules, how much to learn, time spent on learning, how much revision is done, and the references they have to support learning. An example of a response for respondents who scored very high TPACK level is

> I think I learn best when I am setting my own learning rules. I can adjust how much to learn, and the time I spend on a course, and if I must revisit the course, I would like to have a say in that too. I would like to be able to hit the pause button and resume anytime I like. I'd be put off if there is a due date looming every time I learn something new. When I am good at something, I skip most of the course or I skim through it quickly. When I am weak in some respects, I tend to need to go through it several times over several days. (Han: Very High TPACK, M=4.25, 26 to 35 years old male, 6 to 15 years of teaching experience).

An example of a response for respondents who scored a moderate TPACK level is

> Whenever the school has technology-related training, it is very nerve-wracking when the presenter uses all the technical jargon in short forms and assumes everyone knows what they mean. It was already hard enough learning to use the technology tool. I find it the best when I get to learn at my own pace and have reference material that I can follow step by step. If I can refer to the steps any time I need to repeatedly, I will feel more comfortable about it. (Xiao: Moderate TPACK, M=2.67, 56 years old and above male, 16 to 25 years of teaching experience).

4.3.3 Professional Support

The interview also identified the theme of learning support with the codes of collegiality and resource availability. This factor was also identified in the responses of teachers from all three levels of moderate, high, and very high TPACK. Learning support mentioned by the respondents varied in the aspects of the medium through which teachers gained them, the form of support that teachers received, and the role that the support played in teachers' learning. Under the code of collegiality, teachers explained that both informal and formal support they received from colleagues determined how effective their learning is. A good relationship with other teachers in the same school provided teachers with both moral and technical support. This goes beyond the English language panel teachers as respondents added that they also received support from colleagues who are teaching the same group of students for other subjects. Collegiality also created a conducive learning environment for teachers to collaborate with other teachers in their learning. Respondents stated that professional learning communities within their own school and district increased the exposure and opportunities to informally learn and observe how other teachers would integrate technology into their lessons. The sharing of best practices was also stated as a determiner of teachers' decision to learn or master certain technology tools when they see or hear success stories of integration. Furthermore, respondents also acknowledged that having a mentor or a buddy helps when making decisions in their learning, or problem-solving while learning. This can be in aspects of technical hiccups, classroom management and delivery, or lesson planning. Examples of responses providing information for this code are

> For the Professional Learning Communities program in our panel, we go to others' classes and look at their lesson plans and learn from what they do. It's not a compulsory task, and we do it voluntarily. I like this because everyone takes what they need from a class. There is no fixed or designated content that I must learn or use. Everyone has something different they take away. (Xiao: Moderate TPACK, M=2.67, 56 years old and above male, 16 to 25 years of teaching experience).

> We have a scheduled IT-buddy support session every Thursday. If there was nothing to discuss, my buddy would share a small Microsoft Excel tip. I think it is very effective because my buddy and I have overlapping classes of students. If they told me what the students could do in their class, I would try to learn to adopt the exact technology tools into my lessons. (Putri: High TPACK, M=3.45, 46 to 55 years old female, 16 to 25 years of teaching experience).

The importance of online support that teachers get in the form of CEFR-aligned curriculum coaches, teacher groups, and professional learning communities is also highlighted in the teachers' responses under the code of collegiality. Teachers state that their online communities of teachers act as their reference for the new CEFR-aligned curriculum, and peers who are better at technology integration into lessons are seen as role models. Examples of responses providing information for this code are

> I have experienced support from our CEFR master trainers, team members in Google Educator Group, e-Didik Malaysia, Google Classroom Training Malaysia and my colleagues at school. Whenever I attend a course or seminar, I join the group chat or Discord so I have someone to refer to when I meet a wall. With the new curriculum, it is very assuring to be able to refer to my CEFR master trainer anytime and get a response.(Farah: Very High TPACK, M=4.28, 36 to 45 years old female, 6 to 15 years of teaching experience).

> I think I am better than most of my peers, but I have seen teachers in my online PLC group who have done excellently in technology integration with their students. In comparison, I feel like I shouldn't be complacent with where my skills, and there are a lot more to learn from others who are more advanced, especially in integrating technology seamlessly. (Gary: Very High TPACK, M=4.28, 46 to 45 years old male, 16 to 25 years of teaching experience).

Under the code of resource availability, respondents expressed that they make decisions to learn and improve faster if they have learning resources available. These resources can be in the form of lesson plan samples, technological tools, and technical assistance be it in person or online. The level of technological complexity of the resources and the speed of the responses gained were some important characteristics of the resources available. An example of a response is

> I have an online community on Reddit. I think this type of support system is best for me. In the community, there is a sub-group where teachers can choose to join Discord servers according to their level. I am in the intermediate server and the members are also teachers with a similar level of skills, so we understand the problems faced. The technology usage shared is also within our abilities to execute. There are more than a hundred members from all around the world on my server, so I always get a response almost immediately. (Gary: Very High TPACK, M=4.28, 46 to 55 years old male, 16 to 25 years of teaching experience).

4.3.4 Institutional Support

Shulman and Shulman (2009) proposed that institutional support plays an important role in teacher learning as it provides capital in terms of incentives, physical supplies, moral support, and technical assistance. Institutional support was reported as a factor determining teachers' knowledge learning. The codes identified were national and school policy, funding, and motivation from the institution.

Under the code of the policy of organisational institutions, respondents explained that when the Malaysian Ministry of Education has an unambiguous policy outlined in the curriculum, teacher's handbook, and teaching materials for the CEFR-aligned curriculum, they feel more confident in technology integration and are motivated to learn in-depth about how to execute the integration more effectively. This also translates into the school policy whereby technology usage is encouraged and technology-related professional development courses and training for the new curriculum are supported. Respondents elaborated on how they do not have to worry about parents questioning their method of delivery as the new CEFR–aligned textbooks suggested for these technology tools to be used, and the school administration is supportive of it. An example of a response is

> I think I am more motivated to learn how to use technology tools in my lessons and am more confident because I know that it is the government's policy, and the school is encouraging it too. I don't have to worry about the possibility of parents complaining when I assign tasks that require students to produce and practice the usage of English on an online platform because they are suggested in the CEFR textbook itself. I have met with several parents who asked me to stick to drilling for SPM before this. For the new CEFR curriculum, we have briefed the parents during the Parents Teachers Association meeting that we would be encouraging task completion on digital tools, and I am glad we do not have that problem anymore. (Diya: Very High TPACK, M=4.60, 36 to 45 years old female, 6 to 15 years of teaching experience).

It was also revealed in the interview responses that teachers learn and practice technology integration into their lessons because of the incentive whereby teachers' technology integration will reflect positively on the score of their annual performance evaluation by the school administration. An example of a response that provided such information is

> Being able to integrate technology into my teaching will often mean a higher score for my performance grading during observation. (Emma: Very High TPACK, M=4.59, 26 to 35 years old female, 6 to 15 years of teaching experience).

The respondents also pointed out that having adequate funding from either the Ministry of Education, the school, or non-government organisations helps in up-skilling their technology integration expertise. With the new material, particularly the textbook, teachers could approach stakeholders to request for support to create a digital learning environment. Teachers explained that when their students do not have access to computers or mobile devices in their classroom, they do not see the purpose of learning many technology tools. When there was enough funding to equip a digital classroom, teachers did not have to work within the very limited frame of only the teachers having a digital tool and internet connection in the class. An example of a response is

> Encouragement from the management and support from the Non-Government Organisations by providing technology tools to be used in the classroom motivated me to learn. When we approached our Highly Immersive Program NGO partners about the new CEFR curriculum, they funded tablets for several language labs and mobile internet connection that made it possible for students who do not have these to learn and use them. This lifted the limitations on what I learned when I plan my lessons with technology integration. I used to think that it was useless for me to learn to use many of the tools, platforms, apps, and websites when it is not possible to be carried out in my classes. (Tiong: Moderate TPACK, M=3.18, 46 to 55 years old female, 46 to 55 years of teaching experience).

4.3.5 Proven Success

The interview responses also showed proven success as one of the determining factors for teachers' TPACK. The codes identified were the positive experience of technology integration and the proven success of any integration effort. This factor was also identified in the responses of teachers from all three levels of moderate, high, and very high TPACK.

Under the code of proven success, respondents explained that their experience in classroom management and lesson delivery enables them to anticipate if an integration effort is practical or not. The teaching experience provides teachers with information for pedagogic decisions made in terms of technology integration in their teaching environment and subsequently determines what teachers decide to learn. This may also be specific to every teacher and differ according to class, or even individuals, depending on what is applicable to each situation. An example of a response is

> Teaching experience is the filter of what is applicable, so I know what technology integration is going to work in class. That is a very efficient way

> of learning something new for me. (Brian: Very High TPACK, M=4.77, 36 to 45 years old male, 6 to 15 years of teaching experience).

Under the code of proven success, respondents also explained that their experience with students helped to gauge if students would react positively to a lesson with the integration of a particular technology tool and if it would benefit the lesson delivery and students' task completion. An example of a response is

> When we look at certain technology tools, they may appear to be helpful or interesting. However, it may not be realistic to work with certain students especially if the application may not be student-friendly or if it requires a lot of internet data which some students may not be able to access especially those in rural areas. All these would come into consideration, and we would be able to estimate if we have had a significant amount of teaching experience. (Olivia: High TPACK, M=3.61, 36 to 45 years old female, 6 to 15 years of teaching experience).

Under the code of positive experience, respondents elaborated that seeing or experiencing an effective technology integration helps teachers be assured that they can do more. The ability to deliver the content and solve technical problems motivates teachers to learn more. An example of a response is

> My self-confidence to be better in technology integration was boosted when I tried out the technology (Zoom, Google Meet, Google Classrooms, visualiser), was able to complete the lesson in time, and could troubleshoot and solve problems with the technology tools met during the lesson. When I know I have the capacity to deal with the teaching, technology, and manage the students' task assessment, I know that I can do better when I learn something more complex. (Emma: Very High TPACK, M=4.59, 26 to 35 years old female, 6 to 15 years of teaching experience).

4.3.6 Curriculum

The curriculum was identified as one of the themes for factors determining teachers' TPACK. In the context of the study, the curriculum used is the CEFR–aligned English language curriculum. The codes identified under the curriculum theme are learning objectives, instruction, and evaluation. This factor was also identified in responses of teachers from all three levels of moderate, high, and very high TPACK.

Under the code of objectives, teachers stated that their decision to learn new technology tools is arbitered by whether the integration can create opportunities for better self-directed learning and help students fulfil mandated learning objectives set in the curriculum. The CEFR-aligned curriculum Scheme of Work distributed by the Ministry of Education also encouraged teachers to continuously learn more for technology integration. Teachers expressed that the emphasis on differentiated learning in the CEFR-aligned curriculum encourages them to create tasks for learners on technology devices, especially for learners who complete tasks faster. The extended tasks were also able to be assigned more effortlessly on digital devices such as tablets. An example of a response is

> I look at whether technology can help students in their work. If technology has no important role as a catalyst for task completion, I will decide against it. It is not solely about learning new technology tools, but rather how to use that in my class as suggested by the tasks set in the Close-Up (Form three CEFR) textbook. I will look up information as a preparation, especially to help my students to carry out Project-Based learning. The tasks are quite similar what students used to do in the past, but how students present their work and how they look for information is very different now. Because of that, I learned how to set tasks for both guided and students' self-directed learning. It is more work for me because I have to always learn something new, but I think it is necessary as in our Scheme of Work for the CEFR-aligned curriculum, there is a column that suggests differentiated activities be carried out for fast

> finishers. I always get students to do extended tasks or supplement practice on their own on the tablets for that. It's also a lot easier than having printed sheets carried around for that. (Emma: Very High TPACK, M=4.59, 26 to 35 years old female, 6 to 15 years of teaching experience).

Under the code of instruction, teachers expressed that their decision to learn a tool is affected by how much better or more efficient their delivery of the lesson can be. If the role of technology merely replaces an aspect of their lesson but has no merit in improving the efficiency of instruction, then they are not likely to learn. An example of a response is

> I learn to use applications and online platforms that are time-efficient or cost-effective. If the existing resources in the textbook are good enough, I do not see the need to include technology. (Umaira: Moderate TPACK, M=3.09, 46 to 55 years old female, 26 to 35 years of teaching experience).

Under the code of evaluation, teachers expressed that they would learn technology tools that could provide pedagogical affordances in their progress tracking and summative assessment of students, or those that would help students self-evaluate against the Can-Do statements for the CEFR-aligned curriculum. However, considering the inadequacy in terms of individualised feedback for more complex language tasks, teachers added that such a level of formative assessment feedback would require a very high level of technical competency that comes with many hours of learning and practice. An example of a response is

> I make decisions to learn if there is a built-in evaluation function like Socrative. As there are many students to evaluate every lesson, I look for the most efficient way that can help with assessing whether they have achieved the learning objectives of the day. I try to learn how to better my self-made assessment on different online platforms and mobile applications. When

students can get instant feedback on their tasks and are able to track their own progress within the levels of the CEFR framework, it saves a lot of time for everyone. (Brian: Very High TPACK, M=4.77, 36 to 45 years old male, 6 to 15 years of teaching experience).

4.4 Discussion

4.4.1 Teacher Readiness for Technology Integration in Terms of TPACK

To answer the first research question of what the English language teachers' level of readiness in integrating technology in terms of Technological Pedagogical Content Knowledge is, the analysis of teachers' questionnaire responses showed that teachers reported high TK, PK, TPK, TCK, and TPCK, and very high CK and PCK. This finding is congruent with findings in the study conducted by Azhar and Hashim (2022) which reported Malaysian English language teachers' high level of Technological Pedagogical Content Knowledge for technology integration in all the six domains of TK, PK, TPK, TCK, PCK and TPCK, and very high CK. Both Azhar and Hashim (2022) and the present study were conducted in the context of the new English language curriculum. The consistent findings across the studies suggest that the current in-service English language teachers in Malaysia have a high and very high level of readiness to integrate technology in terms of TPACK in the context of the current CEFR-aligned teaching environment.

Teachers in the present study reported high mean scores for technological-based items, including statements on content production via technology like the item "I can create multimedia (e.g. video, web pages) using text, pictures, sound, video, and animation" under the TK domain, and item "I can design learning materials by using technology (e.g. mobile applications) that supports students' language learning" under TPK. This differs from Umar et al. (2014) who reported a moderate level for the skills requiring content creation, even though the study reported a high level of basic technological skills. This may be due to technological tools such as, mobile applications, software, and internet connection becoming more accessible (Huang et al., 2020).

This present study also found no significant difference in teachers' TPACK in all demographic variables of age, and gender. This is congruent with the findings by Azhar and Hashim (2022), Mai and Hamzah (2016) whereby gender did not significantly affect teachers' TPACK. This finding is inconsistent with findings in the study by Koh et al. (2010) which reported higher TK in male teachers and in the study by Roussinos and Jimoyiannis (2019) whereby other than TK, male teachers scored themselves higher in all technological-based knowledge domains of TCK, TPK, and overall TPACK. The study by Cheng and Xie (2018) also found gender to be a differentiating factor in teachers' TPACK. Male teachers in the study reported significantly higher technological-based knowledge domains than female teachers.

The study by Chua and Jamil (2012) found that male teachers had higher TK but lower CK and PK than female teachers, resulting in a smaller discrepancy in TPACK levels between genders. Instead of focusing on only one knowledge domain, the interrelation of all the TPACK domains creates the professional knowledge teachers' need for technology integration as a whole (Covey, 2011).

To justify further why gender does not play a significant role in influencing teachers' TPACK, interview responses of one male teacher, Gary and a female peer, Farah were referred. Gary reported a mean score of 3.00 (moderate) for all domains of TK, PK, and TPK, and Farah reported a mean of 4.44 (very high), 4.17 (very high), and 4.14 (very high) for TK, PK, and TPK respectively. Even when Gary identifies himself as being "better than" most of his peers, his experience of others' integration influenced him to score himself comparatively lower. Contrariwise, even though Farah stated that she "may not be the most tech-savvy", the positive effect of the integration in her classes influenced her to score herself comparatively higher. Even though there are inconsistencies in the findings for the role of gender in teachers' TPACK, the data from the interview suggests that the respondents' experience and history within the knowledge domains decided how they scored themselves in the survey questionnaire.

The present study's findings indicated that age and teaching experience did not significantly impact the level of Technological Pedagogical Content Knowledge (TPACK) readiness among teachers. While previous research by Azhar and Hashim (2022) highlighted higher TPACK scores among younger Malaysian teachers, findings from the studies by Mai and Hamzah (2016) and Atabek (2019) argued otherwise, suggesting no significant differences in TPACK across various age groups and teaching experiences. Over two decades ago, Prensky (2001) proposed the concept of a "digital immigrant", hinting at a digital gap between older and younger generations. However, the ubiquity of technology in recent years, illustrated by the marked increase in Malaysian internet usage rates (Malaysian Communications and Multimedia Commission, 2020), suggests a narrowing of this gap. Regardless of initial technological disadvantages, supportive mechanisms can aid senior teachers in integrating technology. Training, peer support, technical assistance, and encouragement have been identified as significant enablers in this context (Mouza et al., 2017; Warschauer & Matuchniak, 2018).

Liu et al. (2015) found that teaching experience influences TPACK's various knowledge domains. Their study, based in China, discovered significant differences in TPACK components among teachers with varying years of experience. In contrast to other research (Chai et al., 2012; Niess & Gillow-Wiles, 2019; Sojanah et al., 2021), this study found that having more teaching experience did not necessarily correspond to higher

TPACK scores. The complexity of the TPACK construct, coupled with various measuring techniques and the diverse educational contexts of different studies, could account for inconsistencies in findings (Mishra & Koehler, 2006; Schmidt et al., 2009; Tondeur et al., 2017; Voogt et al., 2013).

4.4.2 Factors Determining Teachers' TPACK

To answer the second research question of the factors that determine English language teachers' Technological Pedagogical Content Knowledge for technology integration in the CEFR-aligned curriculum, the thematic analysis showed that teachers identified student factors, learning autonomy, professional support, institutional support, proven success, and curriculum as factors which determine their TPACK.

The findings revealed that within the same determinant of learning for technology integration, there are differences between how it affects teachers of moderate, high, and very high levels of TPACK. To help understand these differences, the principles of Adult Learning Theory will be used.

4.4.2.1 Students

One of the foundational principles of Adult Learning Theory, as explained by Knowles (1984), is the need-to-know principle. Adults, including educators, gravitate towards learning subjects that have immediate relevance to their work or personal lives, seeking to understand the rationale behind learning something before engaging in the process itself. This principle is vividly illustrated in the differentiation among teachers based on their Technological Pedagogical Content Knowledge (TPACK).

The curriculum serves as a crucial backbone in shaping teachers' TPACK. Moderate TPACK teachers exemplify this by aligning technology with the curriculum, taking into account the students' technological proficiency and their socioeconomic backgrounds. In areas with limited connectivity, the importance of context becomes paramount, with teachers possibly favouring offline methods (James & Lee, 2020). Such strategic choices underscore the need-to-know principle, where educators want clarity on the direct benefits of their integrative methods to their specific teaching scenarios. Figure 4.1 shows how teachers with moderate, high, and very high TPACK are influenced to learn.

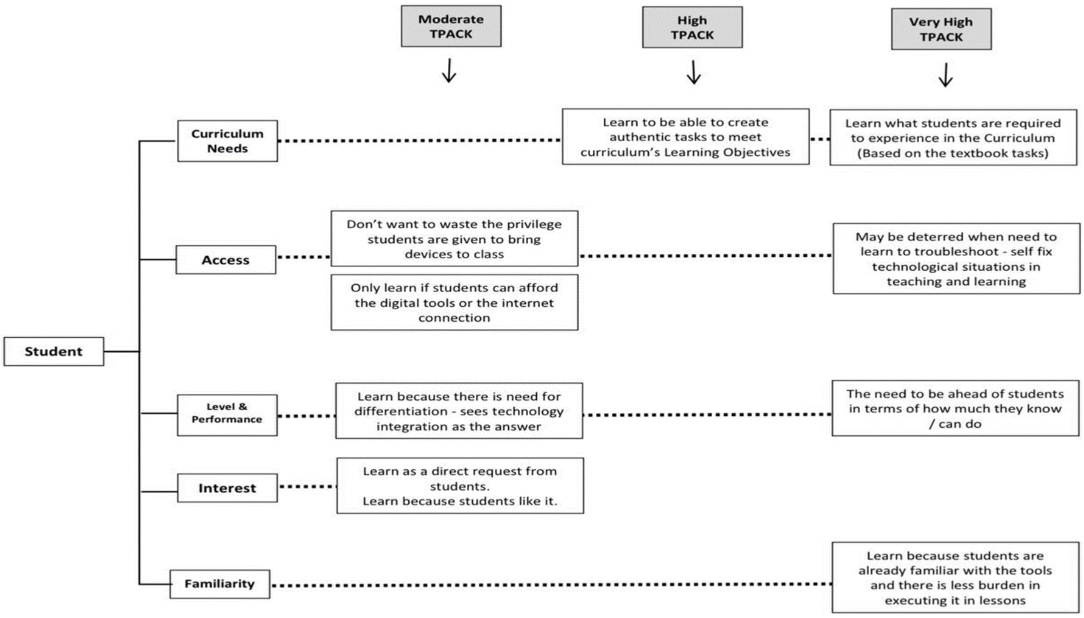

Figure 4.1: Students' Factors Affecting Teacher with Moderate, High, and Very High TPACK

High TPACK teachers, while fundamentally anchored in the curriculum, venture beyond the basic necessities. They actively leverage technology to achieve specific educational objectives, a venture influenced by the available technological tools in their classrooms. Akram et al. (2022) aptly highlight this, emphasising how classroom resource availability directly moulds teachers' pedagogical methods.

Teachers with very high TPACK adopt a panoramic perspective, weaving various factors like students' language skills, interests, performance metrics, and technological familiarity into their instructional strategies. Chai et al. (2010) magnifies this perspective, revealing the symbiotic relationship between students' technological prowess and a teacher's drive. The ability of technology-savvy students to elevate the learning environment juxtaposed with the dampening effect of significant technology skills void underlines the dynamic nature of adult learning.

In summary, teachers, as adult learners, internalise the need to learn, progressing from addressing immediate needs to a more self-directed approach (Merriam, 2011). The level of TPACK among teachers reflects how they perceive this need, ranging from focusing on students' immediate needs and wants to anticipating non-immediate expectations for students. Teachers with moderate TPACK aim to meet students' basic needs and requests, while those with high TPACK focus on fulfilling explicit requirements. Finally, teachers with very high TPACK strive to address students' future needs, extending beyond the immediate.

4.4.2.2 Learning Autonomy

The Adult Learning Theory emphasises the evolution of learners' self-concept. Adult learners are believed to move from being dependent on external guidance towards establishing their self-concept as self-directed and autonomous learners (Knowles, 1980). This principle of self-concept is evident when we observe the progression in teachers' approaches based on their Technological Pedagogical Content Knowledge (TPACK) levels. Figure 4.2 shows how teachers with moderate and very high TPACK are influenced to learn.

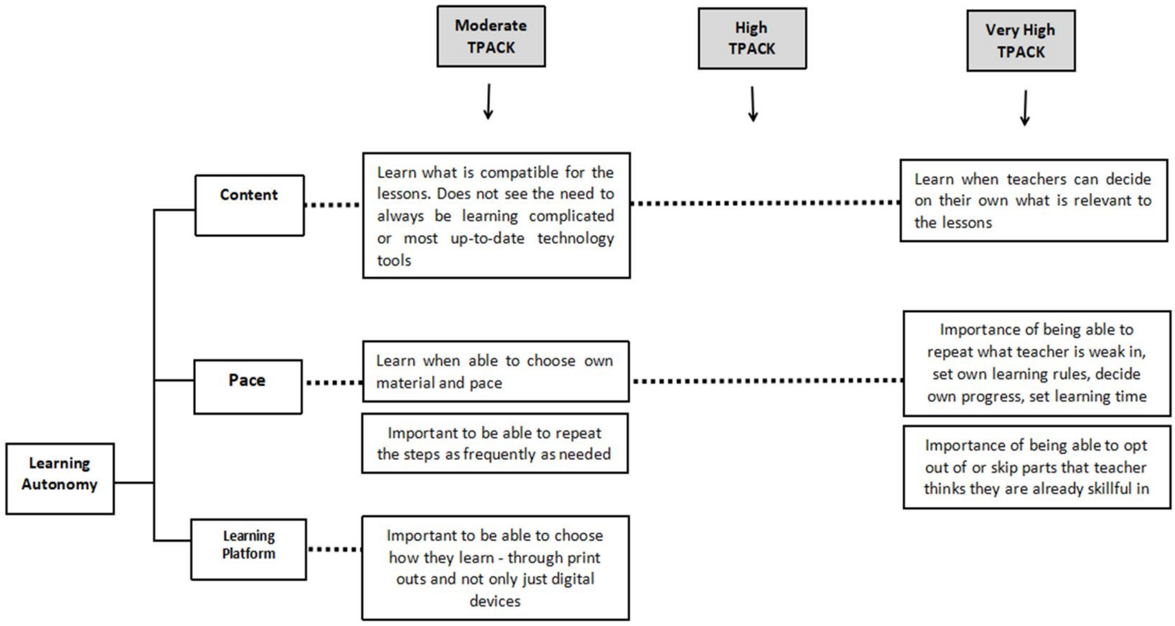

Figure 4.2: Learning Autonomy Affecting Teachers with Moderate and Very High TPACK

Moderate TPACK teachers exhibit a preference for resources offering clear, step-by-step guidance. Their inclination, as described by Balchin and Wild (2020), stems from perceiving technology integration as a duty rather than an innate interest. This stance is reminiscent of adult learners who are still on their path to becoming self-directed, relying significantly on external frameworks and guidelines. However, as highlighted by Little (1991), learning autonomy is indispensable for genuine self-assessment. Zainal and Zainuddin's (2021) findings further emphasise that teachers who pursued technological training out of genuine interest and autonomy displayed better technology integration skills than those who were subjected to obligatory training sessions.

The Very High TPACK educators epitomise the zenith of the adult learner's self-concept. They exercise the utmost autonomy in curating learning materials tailored to their unique needs. For these educators, technology integration is not just a means to enhance pedagogical outcomes but also a route to garner professional acclaim. Atabek (2019) and Ertmer and Ottenbreit-Leftwich (2013) spotlight the symbiosis between personal autonomy and institutional accolades, revealing how both are instrumental in nurturing TPACK expertise. These educators exhibit a drive for independent learning, seeking resources that cater to their unique instructional objectives. By advocating technological freedom, these teachers manifest a core tenet of the Self Determination Theory (Deci & Ryan, 1985; Hargreaves et al., 2013) – the need for autonomy and competency in one's learning trajectory.

To summarise, the transition from moderate to very high TPACK levels mirrors the evolution of the adult learner's self-concept. As teachers journey through these levels, the importance of autonomy in their learning process becomes increasingly prominent, whereby those with better skills and knowledge display more autonomy in their own learning.

4.4.2.3 Professional Support

The Adult Learning Theory places significant emphasis on the past experiences of learners. According to Knowles (1984), experience acts as a basis for their learning. This principle of valuing and building on learners' past experiences is aptly evident as teachers progress from moderate to high, and then to a very high level of TPACK. Figure 4.3 shows how professional support affects teachers with moderate and very high TPACK in learning.

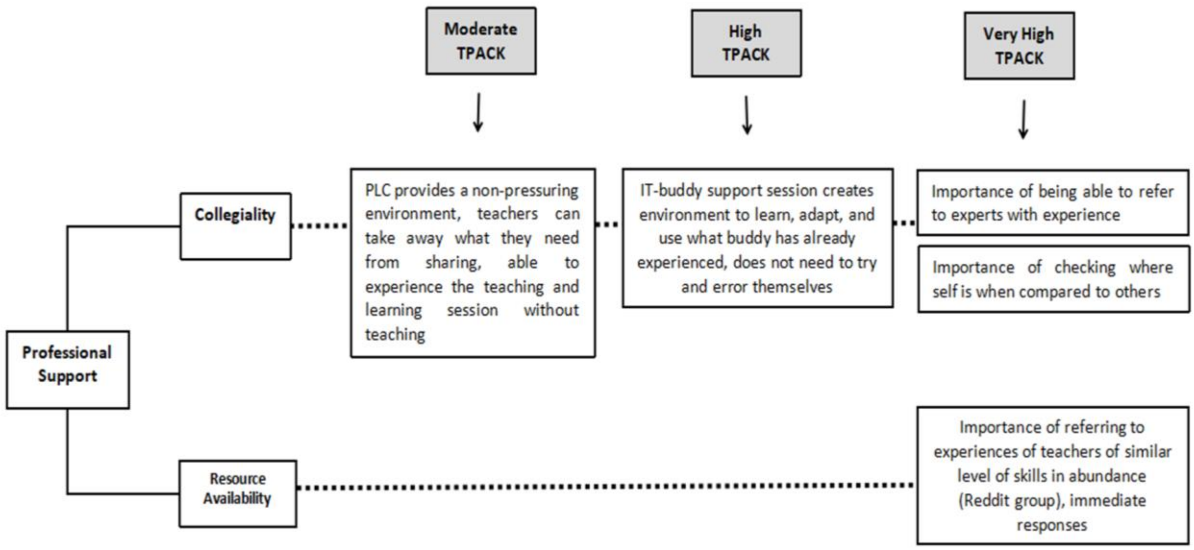

Figure 4.3: Professional Support Affecting Teachers with Moderate, High, and Very High TPACK

For those situated at the moderate TPACK level, their immediate past experiences within their educational setting play a vital role. Collaborations and peer interactions, as suggested by Muhaimin et al. (2019), serve as a benchmark for developing and enhancing their technological knowledge. As these educators are perhaps in the early stages of their technology integration journey, they rely on their day-to-day interactions and experiences in the school environment. These shared experiences, as shown by findings from Abdullah and Hashim (2020), Ansyari (2015), and Chiu (2022), offer valuable practical insights that sometimes surpass the structured knowledge gained from formal technological training, a perspective reinforced by Dong et al. (2019).

Teachers with high TPACK seek to diversify their learning resources. While they continue to value the shared knowledge of their peers, they further extend their collaborative networks. This includes mentorships from a broader professional network (Muhaimin et al., 2019).

The teachers with very high TPACK display a marked preference for accessing expert knowledge directly, emphasising the importance of high-level guidance and the ability to benchmark their progress against experienced peers. Their inclination to seek support from those with similar skill levels suggests a focus on continuous improvement and peer validation, demonstrating an advanced stage of self-directed learning where the quality and relevance of input become critical to their professional development.

In summary, the progression from moderate to very high TPACK levels reflects an increasing reliance on past experiences and a shift toward more self-directed and diversified learning. Teachers at the moderate level rely on daily interactions and shared experiences within their schools to develop their technological knowledge. As they advance, they broaden their resources through professional networks and mentorship. At the highest TPACK levels, they prioritise direct access to expert knowledge and validation, indicating a mature, self-driven approach to professional growth.

4.4.2.4 Institutional Support

As adult learners progress and become more skilled, their motivation to learn shifts from extrinsic rewards to intrinsic satisfaction (Knowles, 1984). This shift is evident in how teachers with different levels of TPACK are motivated by different factors. Figure 4.4 institutional support affects teachers with high and very high TPACK in their learning.

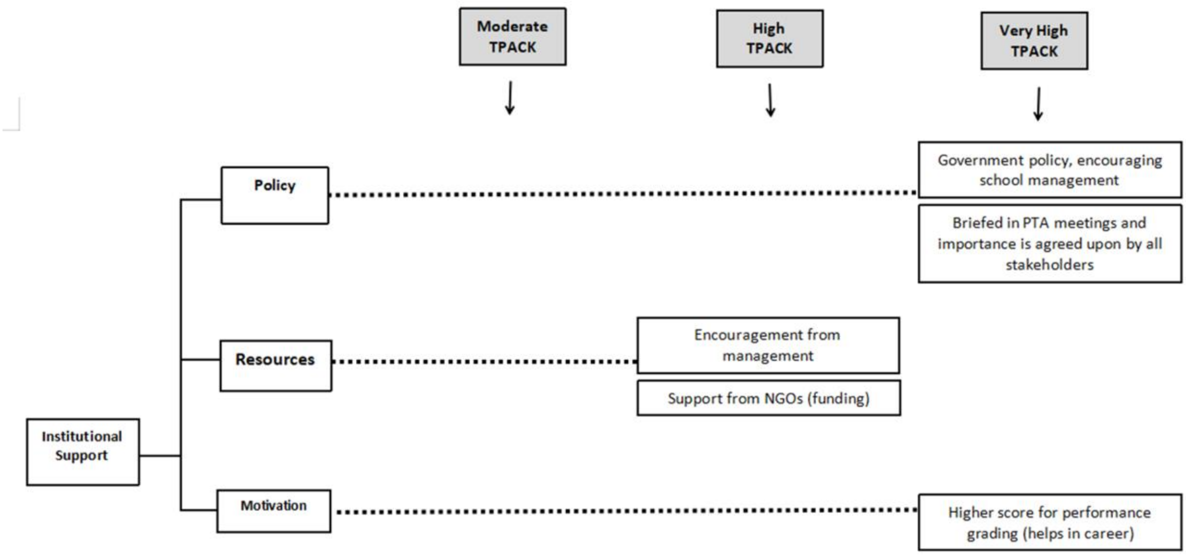

Figure 4.4: Institutional Support Affecting Teachers with High, and Very High TPACK

For teachers with high TPACK, motivation is still largely driven by extrinsic factors, such as monetary funding or access to physical resources. These external rewards provide tangible support that enhances their ability to integrate technology into their teaching. However, as teachers reach very high levels of TPACK, their motivation increasingly stems from intrinsic factors. They are driven by a desire to excel in their work, continuously improving their skills and effectiveness in the classroom. This aligns with Deci and Ryan's (1985) theory that as perceived competence increases, so does intrinsic motivation.

4.4.2.5 Proven-Success

Teachers, as adult learners, are motivated to learn when they believe it will help them address real-life tasks or problems (Knowles, 1984). Practical successes, whether from personal experience or peers, provide concrete evidence of technology's benefits in the classroom, boosting motivation to integrate it. Hesitations, as noted by Rodriguez (2004), often stem from a fear of the unknown and uncertainty about the relevance or benefits of new approaches. According to the Adult Learning Theory's orientation principle, when teachers are presented with clear evidence of success (Albion, 1999; Barton & Dexter, 2019; Jarvis, 1987), they are more inclined to embrace learning. Figure 4.5 shows how it differs for teachers with high and very high TPACK.

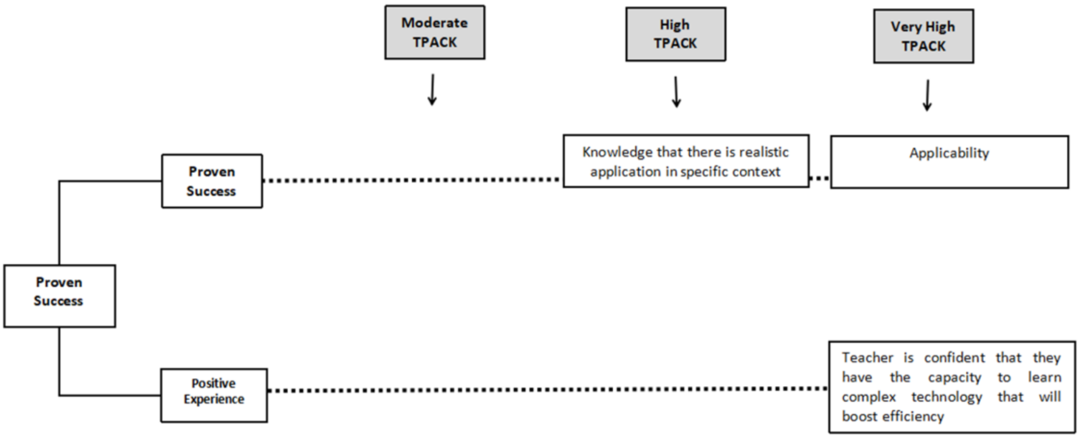

Figure 4.5: Proven Success Affecting Teachers with High, and Very High TPACK

When considering teachers at a moderate TPACK level, their reliance on firsthand classroom management experiences fits seamlessly with the idea of being problem centred. They focus on integrating technology based on immediate classroom challenges, emphasising the direct benefits they have witnessed. Similarly, high TPACK level teachers, in drawing from past student interactions, are also embodying this principle. They are motivated by their experiences, aiming to address and refine specific learning experiences for their students. Their decisions are grounded in real-life classroom situations and are driven by the perceived tangible benefits of technological integration.

Very high TPACK teachers go beyond mere problem-solving; their decisions are oriented towards achieving definitive, superior outcomes. This mirrors the essence of the adult learning orientation, where the focus is not merely on solving immediate problems but also on enhancing one's overall capabilities for future scenarios. Their drive is deeply rooted in the real, tangible benefits they have seen from technology integration, as they constantly seek opportunities for pedagogical refinement.

In summary, for teachers who identified proven success as a key factor in their learning, those with high TPACK value the immediate practical benefits in the classroom. In contrast, teachers with very high TPACK use these positive experiences to build confidence in their ability to learn and apply new strategies in future lessons.

4.4.2.6 Curriculum

The Adult Learning Theory states that adult learners engage in learning primarily to solve problems and achieve specific goals (Knowles, 1984). This principle is reflected in the differing determinants of learning for teachers with moderate and very high TPACK levels, as illustrated in Figure 4.6.

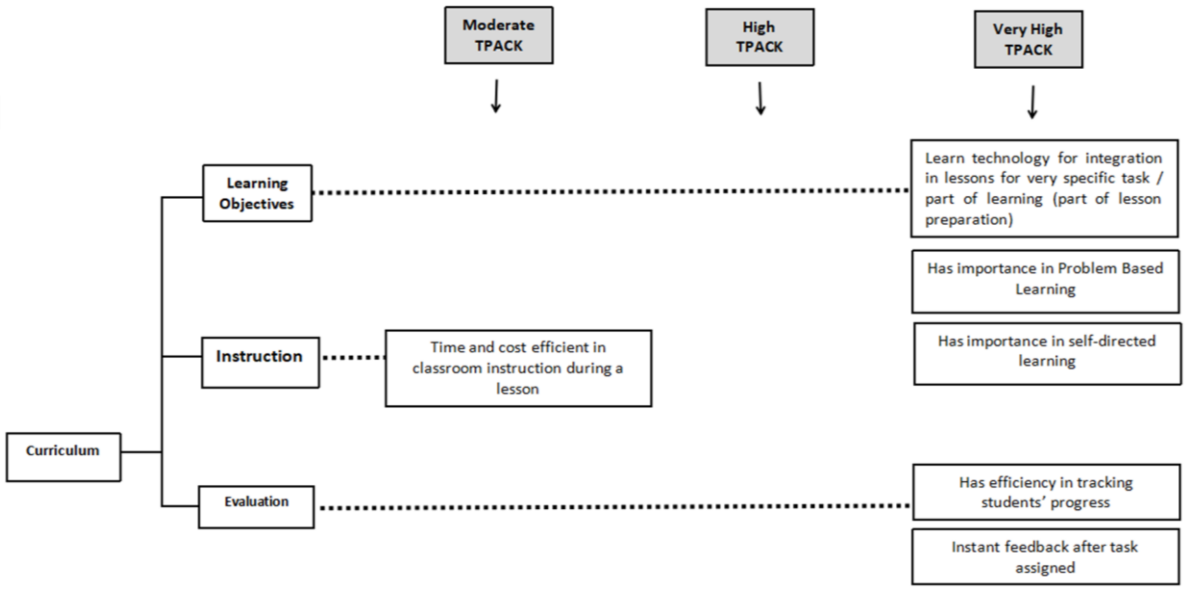

Figure 4.6: Curriculum Affecting Teachers with Moderate and Very High TPACK

For those at a moderate TPACK level, learning is often driven by the need to manage everyday classroom challenges effectively. However, as they advance to a very high TPACK level, their approach becomes more intricate, incorporating problem-based learning, self-directed learning, progress-tracking, and instant feedback mechanisms. This transition signifies a deeper engagement with the learning process, where the motivation to learn is increasingly tied to refining and enhancing their pedagogical practices. The development of expertise, as noted by Forrest and Peterson (2006), involves a shift from mastering simple skills to tackling more complex tasks, mirroring the evolution in how teachers at different TPACK levels approach their professional growth. This may be because, as teachers become more skilled, the challenges they encounter become more specific. By the time they reach a very high TPACK level, they have already mastered solving basic problems encountered earlier in their technology integration journey. Consequently, teachers with very high TPACK levels focus on specific tasks and traits as the key drivers of their learning. In contrast, those with moderate TPACK are still at the beginning of this process, so their learning is primarily centred on addressing basic tasks and responding effectively to immediate challenges.

In summary, as teachers progress in their TPACK development, their learning focus shifts from addressing basic, immediate classroom needs to more sophisticated and goal-oriented tasks.

CHAPTER 5

CONCLUSION

5.1 Summary

This study aims to investigate the readiness in terms of teacher knowledge in integrating technology among English language teachers and to identify the factors that determine readiness in terms of teacher knowledge for technology integration in English language lessons. The two objectives of the research are:

1. to find out the English Language teachers' readiness in integrating technology in terms of Technological Pedagogical Content Knowledge.
2. to examine factors which determine the English Language teachers' Technological Pedagogical Content Knowledge for technology integration.

The study research was guided by the following questions:

1. What is the English Language teachers' readiness in integrating technology in terms of Technological Pedagogical Content Knowledge?
2. What are the factors which determine the English Language teachers' Technological Pedagogical Content Knowledge for technology integration?

In this study, the sequential mixed-method approach was utilised, where general findings from a quantitative questionnaire were later examined in more depth through a qualitative questionnaire focusing on selected individuals. During the quantitative phase, a TPACK questionnaire, adapted from Baser et al. (2016) and grounded in Koehler and Mishra's (2006) TPACK framework, was used to gather data from 201 English language teachers across twenty-eight secondary schools in four districts under the same state education administration. The data gathered from this stage is used to answer the first research question of what is the English Language teachers' readiness to integrate technology in terms of Technological Pedagogical Content Knowledge. Based on their responses, teachers were categorised into TPACK levels according to their mean scores. Next, in the qualitative phase, a semi-structured interview, adapted from Slutsky (2016), was conducted. Purposive sampling was employed to select twenty-four teachers as interview participants, with an equal number of participants chosen from each TPACK level. A thematic analysis was then done on the interview responses to find to answer the second research question of what are the factors which determine the English Language teachers' Technological Pedagogical Content Knowledge for technology integration. After the factors have been identified, the study then looked into how the factors may differ for teachers in different levels of TPACK. This was done with the principles of Adult Learning Theory as guidance.

Findings showed that teachers demonstrated a high level of TK, PK, TPK, TCK, and TPCK, and a very high level of CK and PCK. CK was the highest-scoring domain, followed by PCK and PK, while the technological knowledge domains of TCK, TPCK, TK, and TPK had slightly lower mean scores. This suggests that teachers perceive themselves as more proficient in content-related knowledge than in technological knowledge.

In the domain of TK, the scores indicate that while teachers have a solid foundation in basic technological knowledge, there appears to be less focus on advancing skills such as troubleshooting and multimedia creation. Regarding PK, teachers exhibit confidence in their pedagogical knowledge, though they are somewhat less assured in supporting students' independent learning outside the classroom context. In CK, the results suggest that teachers have a strong grasp of English language skills, particularly in comprehension, though slightly lower scores in speaking and writing point to areas where further practice or professional development could boost their confidence and proficiency. For TPK, the findings show that teachers are generally skilled in integrating technology into their pedagogy, but there are areas, like designing digital materials and addressing individual needs, that could benefit from further development. In TCK, the scores suggest that teachers are proficient in using technology to enhance content delivery and communication in English, yet ongoing professional development, particularly in advanced or community-oriented technologies, could further solidify their expertise. Next, the PCK findings reveal that teachers excel in evaluation and classroom management, though additional professional development aimed at refining instructional strategies and adapting lessons. Finally, in the TPCK domain, teachers are shown to be reasonably adept at incorporating technology into their pedagogical practices, particularly in collaborative and professional development settings. However, there is a need for targeted professional development focusing on the effective use of Web 2.0 tools and promoting student independence in technology use to better support diverse learning needs.

For the demographic variables, no statistically significant differences were observed between the age groups, gender, and years of experience. Across all age groups, CK and PCK consistently scored the highest. Teachers aged twenty five and below scored slightly lower in pedagogical domains but excelled in technological areas, likely due to their recent education and familiarity with digital tools. Teachers in the twenty six to forty five age range performed well across all domains, benefiting from a balance of experience and adaptability. Older teachers, particularly those aged forty six and above, scored lower in technological domains but compensated with strong foundations in traditional pedagogy. Overall, no significant differences in TPACK were observed between age groups, as strengths in one area often balanced out weaknesses in another. Furthermore, gender was found to have little influence on teachers' proficiency, likely reflecting similar training and preparation for both male and female teachers. The findings indicate that both genders exhibit a high level of readiness in technological pedagogical content knowledge. Other than that, in terms of years of experience, teachers' technological competence could be attributed to effective ongoing professional development and training, which keeps their skills current regardless of experience. The COVID-19 lockdowns also may have played a crucial role, forcing both novice and experienced teachers to quickly adapt to new technological tools and methods for remote teaching. This adaptation likely contributed to a more consistent level of competence in technology integration across all experience levels, ensuring that all teachers are equally prepared to incorporate technology into their teaching.

Answering the second research question, six factors of students, learning autonomy, professional support, institutional support, proven success, and curriculum were found to be affecting teachers' TPACK development. Findings also showed that within the six factors, the focus is different for teachers in different levels of TPACK.

Among teachers who stated students as a factor determining their learning, they move from addressing immediate needs to adopting a more self-directed learning approach. Their level of TPACK reflects this progression, with teachers at moderate TPACK levels focusing on meeting students' basic needs and requests. Those with high TPACK concentrate on fulfilling explicit requirements, while teachers with very high TPACK anticipate and address future needs, extending their focus beyond the immediate. For teachers citing learning autonomy as a determinant for TPACK development, the progression from moderate to very high TPACK levels reflects the development of the adult learner's self-concept. As the TPACK level increases, the significance of autonomy in their learning process grows, with those possessing higher skills and knowledge demonstrating greater independence in their learning. For those who stated professional support as a factor for their learning, the shift from moderate to very high TPACK levels shows a growing dependence on past experiences and a move towards more self-directed learning. Teachers at the moderate level develop their technological knowledge through daily interactions and shared experiences within their schools. As they progress, they expand their resources by engaging with professional networks and mentorship. At the highest TPACK levels, they focus on direct access to expert knowledge and validation, reflecting a self-driven approach. Among teachers whose learning is determined by institutional support, for those with high TPACK, motivation is mainly driven by extrinsic factors like funding and resources supporting their technology integration efforts. However, at very high TPACK levels, motivation shifts towards intrinsic factors, with a focus on excelling and continuously improving their skills. For teachers who stated proven success as a determining factor to their learning, those with high TPACK sees advantage in the immediate practicality in classrooms, whereas those with very high TPACK are able to use positive experience to boost confidence in their capacity for learning for future lessons. Among teachers who stated curriculum as a factor for TPACK development, their focus shifts from tackling basic, immediate classroom needs for those at the moderate TPACK lavel, to engaging with more complex and goal-oriented tasks for teachers at the very high TPACK level.

5.2 Implications of The Findings

To summarise, the findings of this study suggest that the current in-service English language teachers in Malaysia have a high and very high level of readiness to integrate technology in terms of TPACK in the context of the current English language lessons.

When considering student factors, curriculum requirements, students' access to and familiarity with technology tools, their language proficiency and performance, and interests informed the decision-making in teachers' development of TPACK to integrate technology into their classrooms. These factors also were shown to be determinants of the teachers' motivation and confidence in learning new technology for language teaching, and their willingness to experiment with innovative teaching methods.

The findings also highlighted the importance of fostering learning autonomy among teachers as it increases motivation and investment into the development of their TPACK, which in turn leads to more technology integration in the classroom. Educational institutions and policymakers need to reconsider the design of teachers' professional development programs by tailoring them to subject matter, individual needs, skill levels, and their teaching context. Other than that, professional development opportunities need to be available on varied platforms and mediums of presentation, including self-directed learning such as online courses and webinars, catering to teachers' diverse needs and learning preferences. Another implication of the findings for teachers' learner autonomy is that it is important to promote a culture of trust and support within schools whereby teachers are encouraged to explore and apply new technologies, take risks, and learn from their experiences. This can be created by providing a supportive work environment where technology experimentation and innovation are appreciated. Teachers should feel safe to share their success stories and challenges with colleagues in terms of learning for technology integration and development of their TPACK. In this way, teacher autonomy can help to boost collective growth and improvement within the school. Additionally, the findings on teachers' learner autonomy underscore the significance of cultivating a growth mindset. When given autonomy and charge over their own growth, a positive attitude is more likely to be developed as the choice of continuous learning is given to them in terms of content, pace, method, and medium. The best decision can also be made as the teachers themselves are most familiar with the context of their teaching and will be the ones who can make the best decision that suits their professional needs.

The findings on factors determining teachers' TPACK also have significant implications for future professional development program designing. First, professional development programs on technology integration should incorporate proven-success evidence through the sharing of empirical research, case studies, or real-life examples of successful implementation in English language teaching as it would motivate teachers to learn more. Other than that, programs can focus on mastery experiences whereby opportunities are provided for teachers to engage in hands-on experiences with technology integration. This creates a learning platform that allows teachers to experiment and improve their skills, experiencing first-hand how their knowledge can be applied in English language classrooms.

Another implication highlighted was the essential role of curriculum in the development and improvement of teachers' TPACK. At the core of it, the current English language curriculum shapes teachers' TPACK by influencing their perceptions of technology relevance and encourages teachers to integrate it into their teaching. When technology integration is aligned with the curriculum, teachers are encouraged to view technology as a medium to achieve curriculum goals. This, in turn, can motivate teachers to invest in their TPACK development. Furthermore, when the approach is contextually relevant, it can enable teachers to better understand the curriculum's design and areas for technology integration can be identified.

Furthermore, policymakers and educational stakeholders should recognise the importance of providing adequate support and training to teachers of all age groups and experience levels to develop their TPACK skills. This includes facilitating access to technology resources, offering training opportunities, and encouraging collaboration and peer support among teachers. By doing so, they can ensure that all teachers are equipped with the necessary knowledge and skills to integrate technology into their teaching practices, ultimately enhancing the quality of education for students.

5.3 Recommendations for Future Research

The TPACK framework serves not only as a tool for evaluating teacher knowledge but also as a reference to create customised professional development programs that address the specific needs identified through the assessment process. Future research could investigate the effectiveness of professional development programs designed to cater to specific knowledge components that English language teachers lack most based on the TPACK components of TK, PK, CK, TPK, TCK, PCK, and TPCK. Additionally, the effectiveness of focused training could also be investigated based on CEFR learning outcomes in longitudinal studies. The studies could examine the long-term impact on teachers' practice, providing valuable insights into the effective design of sustainable professional development programs that could help enhance teachers' TPACK development.

Another recommendation for future research is to explore the distinction between two approaches to TPACK development among teachers. Research could be done with two conditions of teachers being granted full autonomy in their professional development of TPACK, and when they participate only in compulsory learning programs designed to enhance TPACK. Studies can examine how teachers' complete autonomy could influence their TPACK development. This could look at the resources, strategies, and support systems teachers identify independently to gain more knowledge for technology integration. In the compulsory TPACK-focused professional development, researchers could compare the structure, content, and delivery of these programs, as well as their perceived relevance for English teachers.

In addition, researchers could also investigate the role of the content of compulsory professional development programs in development of teachers' TPACK. By examining these two approaches and the effects that they may have, future research could identify the most effective strategies and content for fostering TPACK development of English language teachers. This in turn, will contribute greatly to the tailoring of more targeted and impactful professional development initiatives, and ultimately improve the overall effectiveness and quality of English language teaching in Malaysia.

5.4 Conclusion

The study provided new and valuable insights into how different factors influence TPACK development at varying levels, a perspective that has not been extensively explored in prior research. It uncovered significant differences in the ways teachers at different stages of TPACK proficiency engage with and learn from technology, highlighting the specific needs, challenges, and motivations that evolve as teachers progress in their technological integration skills. By identifying and thoroughly analysing these factors, the research fills a critical gap in the existing body of knowledge within educational technology.

Moreover, this study illuminated previously unexamined patterns of learning and adaptation among teachers, offering a clearer understanding of how professional development programmes can be tailored to address distinct needs across different proficiency levels. Such findings are crucial in shaping more effective, personalised development strategies, moving away from generic training models. This deeper understanding ensures that professional development aligns with teachers' evolving requirements, thereby enhancing their ability to integrate technology in ways that are pedagogically sound and relevant to their subject matter.

The study advances theoretical understanding of TPACK development and also provides practical, actionable insights for educational institutions and policy makers. This enables them to design programmes that better support teachers in their journey to master technology integration, ultimately improving the quality of teaching and learning.

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